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MANUSCRIPT OF RECORD

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1924

No. 102

**WESTINGHOUSE ELECTRIC & MANUFACTURING
COMPANY, PETITIONER.**

THE FORMICA INSULATION COMPANY.

**ON WRIT OF HABEAS CORPUS TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE SEVEN CIRCUIT.**

PETITION FOR HABEAS CORPUS FILED JUNE 11, 1925

WRIT GRANTED AND RETURN FILED NOVEMBER 9, 1925

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SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1923

No. 401

WESTINGHOUSE ELECTRIC & MANUFACTURING
COMPANY, PETITIONER,

vs.

THE FORMICA INSULATION COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE SIXTH CIRCUIT

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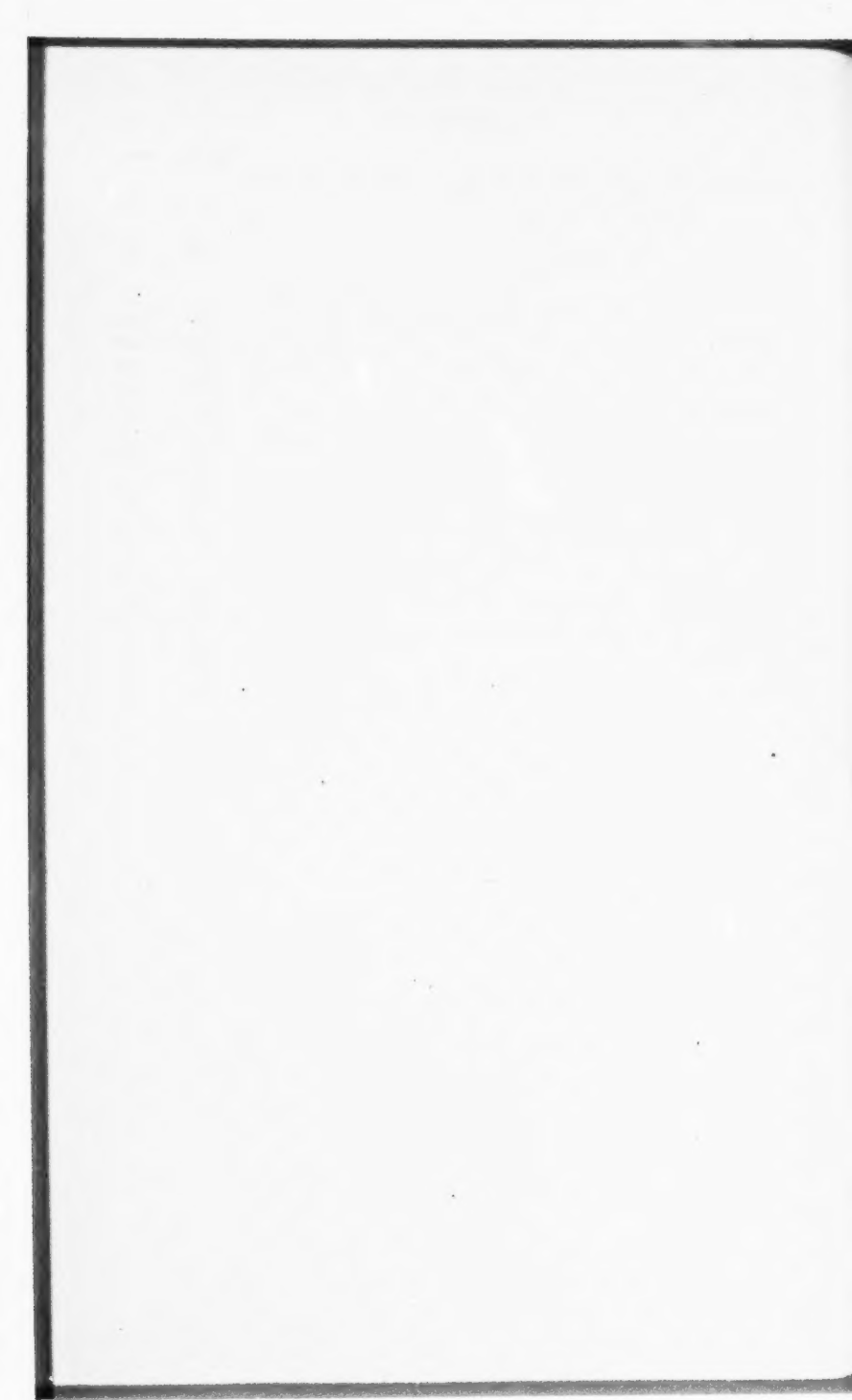
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[fol. 1] **DISTRICT COURT OF THE UNITED STATES, SOUTH-
ERN DISTRICT OF OHIO, WESTERN DIVISION**

In Equity. No. 214

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY,
Plaintiff,

vs.

THE FORMICA INSULATION COMPANY, Defendant

Patents Nos. 1,284,296, 1,284,432, and 1,323,039

BILL OF COMPLAINT

The plaintiff, Westinghouse Electric & Manufacturing Company, is a corporation duly organized and existing under the laws of the State of Pennsylvania, and has its principal place of business at Pittsburgh, in said State, and that defendant, The Formica Insulation Company, is a corporation duly organized and existing under the laws of the State of Ohio, having a regular and established place of business at Cincinnati, County of Hamilton and State of Ohio, and in the Southern Judicial District of Ohio, Western Division, at which place and within which District the acts hereinafter complained of as infringements have been and are being done by said defendant.

2. That this is a suit brought under the patent laws of the United States for the infringement by the defendant of Letters Patent of [fol. 2] the United States, No. 1,284,296, granted on November 12, 1918, on the invention of Louis T. Frederick, for Process of Making Laminated Articles; No. 1,284,432, granted on November 12, 1918, on the invention of Daniel J. O'Connor, Jr., for Process of Making Composite Material, and No. 1,323,039, granted on November 25, 1919, on the invention of Louis T. Frederick, for Method of Making Rods, Cylinders and the Like, all issued to plaintiff, as assignee of the said inventors.

3. That on and prior to the 18th day of December, 1914, Louis T. Frederick, being a citizen of the United States, was, within the meaning of the statutes of the United States then in force, the first, sole, true and original inventor of certain new and useful improvements in Process of Making Laminated Articles, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor, and no application for any foreign patents having been filed more than twelve months prior to the filing of the application for Letters Patent in this country, and which improvements had not been in public use or on sale in the

United States for more than two years prior to his said application for Letters Patent therefor and not abandoned to the public.

4. That on the 18th day of December, 1914, the said Louis T. Frederick made and filed an application in writing to the Commissioner of Patents of the United States for the grant of Letters Patent upon the said invention for improvements in Process for Making Laminated Articles, said application bearing Serial No. 877,979; that said application was allowed to lapse for failure to pay the final Government fee thereon, and a renewal application for the invention thereof was duly filed in the United States Patent Office on October 2, 1918, and was given Serial No. 256,627; that the said Louis T. Frederick [fol. 3] duly assigned to plaintiff the said application and the invention thereof; that on the 12th day of November, 1918, all of the requirements of the statutes of the United States then in force having been duly complied with, Letters Patent of the United States No. 1,284,296, for improvements in Process of Making Laminated Articles, were duly issued on the said application to the plaintiff; that said Letters Patent were issued in due form of law in the name of the United States of America under the seal of the Patent Office of the United States, signed by the Commissioner of Patents, duly recorded and delivered to plaintiff, and were so issued after due examination as to the novelty, patentability and utility of the inventions therein described and payment of the fees required by law, and that said Letters Patent granted to plaintiff, its successors and assigns, for the full term of seventeen (17) years from the date thereof, the full and exclusive right and liberty of making, using and selling the inventions set forth, described and claimed therein throughout the United States and territories thereof.

5. That on and prior to the 1st day of February, 1913, Daniel J. O'Connor, Jr., being a citizen of the United States, was, within the meaning of the statutes of the United States then in force, the first, sole, true and original inventor of certain new and useful improvements in Process of Making Composite Material, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor, and no application for any foreign patents having been filed more than twelve months prior to the filing of the application for Letters Patent in this country and which improvements had not been in public use or on sale in the United States for more than two years prior to his said application [fol. 4] for Letters Patent therefor and not abandoned to the public.

6. That on the 1st day of February, 1913, the said Daniel J. O'Connor, Jr., made and filed an application in writing to the Commissioner of Patents of the United States for the grant of Letters Patent upon the said invention for improvements in Process of Making Composite Material, said application bearing Serial No. 745,616; that the said Daniel J. O'Connor, Jr., duly assigned to plaintiff the said application and the invention thereof; that on the 12th day of

November, 1918, all of the requirements of the statutes of the United States then in force having been duly complied with, Letters Patent of the United States, No. 1,284,432, for improvements in Process of Making Composite Material, were duly issued on the said application to the plaintiff; that said Letters Patent were issued in due form of law in the name of the United States of America, under the seal of the Patent Office of the United States, signed by the Commissioner of Patents, duly recorded and delivered to plaintiff, and were so issued after due examination as to the novelty, patentability and utility of the inventions therein described and payment of the fees required by law, and that said Letters Patent granted to plaintiff, its successors and assigns, for the full term of seventeen (17) years from the date thereof, the full and exclusive right and liberty of making, using and employing the inventions set forth, described and claimed therein throughout the United States and territories thereof.

7. That on and prior to the 15th day of May, 1917, Louis T. Frederick, being a citizen of the United States, was, within the meaning of the statutes of the United States then in force, the first, sole, true and original inventor of certain new and useful improvements in Method of Making Rods, Cylinders and the Like, not known or [fol. 5] used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor, and no application for any foreign patents having been filed more than twelve months prior to the filing of the application for Letters Patent in this country and which improvements had not been in public use or on sale in the United States for more than two years prior to his said application for Letters Patent therefor and not abandoned to the public.

8. That on the 15th day of May, 1917, the said Louis T. Frederick made and filed an application in writing to the Commissioner of Patents of the United States for the grant of Letters Patent upon the said invention for improvements in Method of Making Rods, Cylinders and the Like, said application bearing Serial No. 168,667; that said Louis T. Frederick duly assigned to plaintiff the said application and the invention thereof; that on the 25th day of November, 1919, all of the requirements of the statutes of the United States then in force having been duly complied with, Letters Patent of the United States, No. 1,323,039, for improvements in Method of Making Rods, Cylinders and the Like, were duly issued in due form of law in the name of the United States of America under the seal of the Patent Office of the United States, signed by the Commissioner of Patents, duly recorded and delivered to plaintiff, and were so issued after due examination as to the novelty, patentability and utility of the inventions therein described and payment of the fees required by law, and that said Letters Patent granted to plaintiff, its successors and assigns, for the full term of seventeen (17) years from the date thereof, the full and exclusive right and liberty of

making, using and employing the invention set forth, described and claimed therein throughout the United States and territories thereof.

[fol. 6] 9. That since the assignment of the said applications and inventions thereof which matured in Letters Patent of the United States Nos. 1,284,296, 1,284,432 and 1,323,039, plaintiff has been, and now is, vested with the entire right, title and interest in and to the same, and entitled to all damages or profits from any and all infringements of said Letters Patent.

10. That each and all of the said improvements and inventions or discoveries described and claimed in your orator's said three Letters Patent are capable of conjoint use in one and the same unitary structure, apparatus, device or employment, and are, in fact, so conjointly used by the defendant in the acts of infringement complained of herein.

11. That, on information and belief, the said defendant, The Formica Insulation Company, well knowing the premises and the rights secured to the plaintiff herein as aforesaid, without the license or permission, and in violation and infringement of the plaintiff's rights under said Letters Patent Nos. 1,284,432, 1,284,296 and 1,323,039, and contriving to injure the plaintiff and deprive it of the benefits and advantages which might and otherwise would accrue unto it from said inventions, after the issuing of the Letters Patent as aforesaid and before the commencement of this suit, did unlawfully make, use and employ within the Southern District of Ohio, Western Division, and elsewhere in the United States, and is now making, using and employing, and is threatening to continue to make, use and employ within the said District and elsewhere in the United States the inventions embraced in and covered by claims 11 and 12 of said Letters Patent No. 1,284,432, claims 2, 3, 4, 7, 11, 12, 13, 14 and 15 of said Letters Patent No. 1,284,296, and Letters Patent No. 1,323,039.

[fol. 7] 12. That, on information and belief, the said defendant has derived and received, and will derive and receive, from the aforesaid infringement, gains, profits and advantages, but to what amount plaintiff is ignorant and cannot set forth; that the plaintiff by reason of the aforesaid infringement has been and will be deprived of and prevented from receiving, if such infringement is not restrained by this court, all the gains and profits to which the plaintiff is lawfully entitled, and which it would have derived and received, and would now be deriving and receiving but for the aforesaid infringement; that by reason of the aforesaid infringement, the plaintiff has been irreparably injured and sustained loss and damage thereby; and unless the aforesaid infringement is immediately restrained by an order and writ of injunction issuing out of this court, further irreparable injury, loss and damage will be caused to the plaintiff.

13. That the defendant was duly notified of its infringement of said Letters Patent Nos. 1,284,296, 1,284,432 and 1,323,039; but nevertheless, as plaintiff is informed and believes, and therefore avers,

defendant continued to infringe since said notice, whereby defendant has continued to profit and the plaintiff has been damaged.

Plaintiff therefore prays:

(a) For a permanent injunction and a preliminary injunction pending this suit restraining the defendant, its officers, attorneys, agents, servants, employees and all others acting by and under its direction or authority, from directly or indirectly making or causing to be made, using or causing to be used, selling or causing to be sold, the said inventions embraced in or covered by claims 11 and 12 of Letters Patent No. 1,284,432, claims 2, 3, 4, 7, 11, 12, 13, 14 and 15 of Letters Patent No. 1,284,296, and by Letters Patent No. 1,323,039, or from infringing upon or violating the inventions of the said Letters Patent in any way whatsoever.

[fol. 8] (b) For costs of this suit and for an account of profits accrued to defendant and damages sustained by plaintiff resulting from said infringement, and that any damages so assessed may be tripled.

(c) For such other and further relief as the circumstances of the case may require.

Westinghouse Electric & Manufacturing Company, By Charles A. Terry, Vice-President. Kerr, Page, Cooper & Hayward, Solicitors for Plaintiff. John C. Kerr, Of Counsel.

Jurat showing the foregoing was duly sworn to by Chas. A. Terry omitted in printing.

[fol. 9] DISTRICT COURT OF THE UNITED STATES, SOUTHERN DISTRICT OF OHIO, WESTERN DIVISION

[Title omitted]

ANSWER

Defendant, reserving all rights to which it may be entitled, and answering the Bill of Complaint:

1. Admits that plaintiff is a corporation of the State of Pennsylvania, and that defendant is a corporation of the State of Ohio, having a regular and established place of business at Cincinnati, Ohio.

2. Admits the allegation in paragraph 2 of the Bill of Complaint, while denying that the suit is based upon inventions, which are the inventions of Louis T. Frederick and Daniel J. O'Connor.

3. Denies that on and prior to the 18th day of December, 1914, Louis T. Frederick was the first, sole, true and original inventor of the improvements set forth in Letters Patent No. 1,284,296; denies that the same was not known or used by others in this country and not patented or described in any printed publication in this or any

foreign country before the alleged invention thereof by said Fred- [fol. 10] erick, or more than two years prior to the application; denies that no application for any foreign patents was filed more than twelve months prior to the filing of the application for the patent in this country; and denies that the same had not been in public use or on sale in the United States for more than two years prior to the application of said Frederick, and denies that the same was not abandoned to the public.

4. Admits that on December 18, 1914, said Frederick filed an application in the Patent Office for said alleged Process for Making Laminated Articles; admits that said application was allowed to lapse, and that a renewal application was filed October 7, 1918; is without knowledge of the alleged assignment to plaintiff; admits that on November 12, 1918, Letters Patent of the United States No. 1,284,296, based on said application, were issued to the plaintiff; denies that said Letters Patent were issued in due form of law, were duly recorded, were so issued after proper examination as to novelty, patentability and utility of the alleged invention; and avers that said patent was improperly and improvidently issued.

5. Admits that on and prior to the first day of February, 1913, Daniel J. O'Connor made certain improvements in a Process for Making Composite Material, but denies that the same were of a patentable order, or that said O'Connor was the first inventor thereof; denies that the same were not known or used by others in this country and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor; admits that no application for any foreign patents was filed more than twelve months prior to the filing of the application for Letters Patent in this country; denies that said improvements have not been in public use or on sale in the United States for more than two [fol. 11] years prior to the application of said O'Connor; denies that the same had not been abandoned to the public; and avers that claims 11 and 12 of O'Connor patent No. 1,284,432 are not based upon any invention of said O'Connor, that said claims 11 and 12 are invalid, that said claims 11 and 12 did not appear in the original application of said O'Connor, that they were not supported by the oath either original or supplemental of said O'Connor, and that they were introduced into said application by amendment without the consent of said O'Connor, and are invalid.

6. Admits that on the first day of January, 1913, said Daniel J. O'Connor filed application No. 745,616, which was done at the request of plaintiff; admits that said application was assigned to plaintiff; admits that on November 12, 1918, Letters Patent of the United States No. 1,284,432, based upon said application, were issued to the plaintiff; denies that said Letters Patent were issued in due form of law; denies that the same were issued after proper examination as to novelty, patentability and utility; avers that said patent was improvidently and improperly issued, and that claims 11 and 12 particularly of said patent are invalid.

7. Denies that on and prior to the 15th day of May, 1917, Louis T. Frederick was the first, sole, true and original inventor of improvements in the Method of Making Rods, Cylinders and the Like, which is set forth in Letters Patent No. 1,323,039; denies that the same were not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application for said patent therefor; denies that no application for foreign patents was filed more than twelve months prior to the filing of the application for said Letters Patent in this country; denies that said improvements had not been in public use or on [fol. 12] sale in the United States for more than two years prior to said application; and denies that the same were not abandoned to the public.

8. Admits that on May 15, 1917, said Frederick made and filed an application for Letters Patent No. 1,323,039; is without knowledge of the assignment of said application to plaintiff, but admits that said Letters Patent No. 1,323,039 were issued to plaintiff; denies that all the requirements of the statutes in such cases were complied with; denies that the patent issued in due form of law; denies that any proper examination as to novelty, patentability and utility was made; and avers that said patent was improperly and improvidently issued and is invalid.

9. Is without knowledge as to whether plaintiff has been in possession of the title to said patents 1,284,296, 1,284,432 and 1,323,039 since the issuance thereof, or whether the title is now vested in plaintiff, and leaves the plaintiff to its proof in this behalf; and denies that plaintiff is entitled to all or any damages or profits arising from infringement.

10. Denies that said improvements are capable of conjoint use in one and the same material structure, apparatus, device or employment and are, in fact, so conjointly used by defendant in any act or acts of infringement.

11. Denies that defendant without license or permission, and in the infringement of plaintiff's rights under said patents, has unlawfully made, used or employed said alleged inventions or any of them, or is now making, using or employing said inventions or any of them, or threatening so to do any place within the United States; and denies particularly the infringement of the Claims 11 and 12 of Letters Patent 1,284,432, Claims 2, 3, 4, 7, 11, 12, 13, 14 and 15 [fol. 13] of Letters Patent No. 1,284,296, and the Claims of Letters Patent No. 1,323,039.

12. Denies that defendant has derived or received any gains, profits or advantages by reason of any infringement of said patents or any of them; denies that the plaintiff has been injured and sustained loss and damages thereby; and denies that plaintiff has been anywise injured or that any injury or damage to plaintiff is threatened by any act or acts of said defendant.

13. Denies that defendant was duly notified of the infringement of said patents or any of them, and denies that defendant has continued to infringe since such notice.

14. Denies generally that plaintiff has been injured by any unlawful or improper act of defendant with respect to plaintiff's patent rights referred to in said Bill of Complaint, and denies that plaintiff is entitled to all or any of the relief prayed for in said Bill of Complaint.

15. Avers that the alleged inventions of said Frederick patents and said O'Connor patent, and each of them, were invented, known, practiced, used publicly in this country, and patented prior, respectively, to the supposed invention thereof by said Frederick and prior to the supposed invention thereof by said O'Connor, prior to the filing of the application for each of said patents, and more than two years prior to the filing of the application for each of said patents, by persons and in patents as follows:

[fol. 14]	Patent No.	Date
Leo H. Baekeland, at Yonkers, N. Y.....	941,606	Nov. 30, 1900
Leo H. Baekeland, at Yonkers, N. Y.....	1,019,406	Men. 5, 1912
Leo H. Baekeland, at Yonkers, N. Y.....	1,160,364	Nov. 16, 1915
Leo H. Baekeland, at Yonkers, N. Y.....	989,066	Nov. 16, 1900
Leo H. Baekeland, at Yonkers, N. Y.....	942,690	Dec. 7, 1900
Leo H. Baekeland, at Yonkers, N. Y.....	949,671	Feb. 15, 1910
Leo H. Baekeland, at Yonkers, N. Y.....	954,666	Apr. 12, 1910
Leo H. Baekeland, at Yonkers, N. Y.....	942,700	Dec. 7, 1900
Leo H. Baekeland, at Yonkers, N. Y.....	942,800	Dec. 7, 1900
Leo H. Baekeland, at Yonkers, N. Y.....	1,233,298	July 17, 1917
Leo H. Baekeland, at Yonkers, N. Y.....	1,019,408	Mch. 5, 1912
H. W. Morrow, at Wilmington, Del.....	322,620	July 21, 1885
S. H. Hamilton, of Philadelphia, Pa.....	449,737	Apr. 7, 1891
Henry Dods, at Virginia City, Nev.....	600,576	Mch. 15, 1898
George J. Peacock, at Pittsburgh, Pa.....	746,143	Dec. 8, 1903
Westinghouse Elec. & Mfg. Co., at E. Pittsburgh, Pa.....	858,383	July 2, 1907
Westinghouse Elec. & Mfg. Co., at E. Pittsburgh, Pa.....	858,384	July 2, 1907
Westinghouse Elec. & Mfg. Co., at E. Pittsburgh, Pa.....	858,385	July 2, 1907
Westinghouse Elec. & Mfg. Co., at E. Pittsburgh, Pa.....	858,386	July 2, 1907
Westinghouse Elec. & Mfg. Co., at E. Pittsburgh, Pa.....	1,028,108	June 4, 1912
Arthur Smith, of London, England.....	643,012	Feb. 6, 1900
Adolph Luft, of Lemberg, Austria.....	735,278	Aug. 4, 1903
W. A. Beatty, at New York, New York.....	1,158,962	Nov. 2, 1915
Frank Conrad, at Pittsburgh, Pa.....	1,167,742	Jan. 11, 1916
Frank Conrad, at Pittsburgh, Pa.....	1,167,743	Jan. 11, 1916
W. J. Innis, at Providence, R. I.....	50,204	Sep. 26, 1865
Adolph Muller, at Brooklyn, New York.....	120,210	Oct. 24, 1871
Albert Ball, at Claremont, N. H.....	148,544	Mch. 17, 1874
Chas. V. Mottram, at Lawrence, Kansas.....	157,970	Dec. 22, 1874
R. M. C. Broas, at Jersey City, N. J.....	171,347	Dec. 21, 1875
M. Young, at Frederick Md.....	229,296	June 29, 1880
G. B. Farrington, at Unionville, Conn.....	454,113	June 16, 1891
[fol. 15] M. C. Stone, at Washington, D. C.....	454,145	June 16, 1891
C. W. Jefferson, at Schenectady, New York.....	491,707	Feb. 14, 1893
C. W. Jefferson, at Schenectady, New York.....	491,708	Feb. 14, 1893
C. W. Jefferson, at Schenectady, New York.....	503,716	July 7, 1896
J. J. Bordman, at Brooklyn, New York.....	549,474	Nov. 5, 1896
E. F. Badgley, at San Francisco, Calif.....	623,590	Apr. 25, 1899
J. J. Hinde, at Sandusky, Ohio.....	663,438	Dec. 11, 1900
F. Richardson, at Providence, R. I.....	176,481	Apr. 25, 1876

	Patent No.	Date
S. O. Brock, at Watertown, Mass.....	159,494	Feb. 9, 1875
S. H. Hamilton, at Chicago, Ill.....	269,816	Dec. 26, 1882
J. C. Grant, of London, England.....	613,674	Nov. 8, 1898
C. W. Spurr, at Boston, Mass.....	348,593	Sep. 7, 1886
J. Huebner, at Chicago, Ill.....	1,009,752	Nov. 28, 1911
T. P. Taylor, at Bridgeport, Conn.....	202,257	Aug. 8, 1882
E. F. Upton, at Mineral City, Ohio.....	840,401	Jan. 1, 1907
P. A. Martin, of Birmingham, England.....	745,212	Nov. 24, 1903
C. T. Kingzett, of —, England.....	734,888	July 28, 1903
A. A. Godfrey, of Staines, England.....	835,518	Nov. 13, 1906
J. Ostrander, at Indianapolis, Ind.....	808,775	Jan. 7, 1906
E. W. Snyder, at Olathe, Kansas.....	954,655	Apr. 12, 1910
J. Ostrander, at Indianapolis, Ind.....	902,318	Oct. 27, 1908
J. M. Towne, at East Orange, N. J.....	966,873	Aug. 9, 1910
E. Kempshall.....	700,656	May 20, 1902
W. B. Fenn, at Sheepshead Bay, N. Y.....	819,260	May 1, 1906
J. W. Aylsworth, at East Orange, N. J.....	1,077,113	Oct. 28, 1918
E. W. Snyder, at Olathe, Kansas.....	249,429	Nov. 8, 1881
R. Binns, at South Windham, Conn.....	775,513	Nov. 22, 1904
R. Binns, at South Windham, Conn.....	775,512	Nov. 22, 1904
R. Binns, at South Windham, Conn.....	775,514	Nov. 22, 1904
Lowenthal.....	327,286	Sep. 29, 1885
Nenninger.....	342,377	May 25, 1886
A. L. Hatfield, at Hillside, N. J.....	1,205,345	Nov. 21, 1916
Max Meirouvsy.....	1,124,777	Jan. 12, 1915
Story British Patent.....	8,875	of 1905
British Patent Joseph T. Wicks.....	25,489	of 1899
British Patent Oscar Poppe.....	4,678	of 1906
British Patent J. C. Nichol.....	9,100	of 1896

[fol. 16] 16. Avers that prior to the filing of each of said Frederick applications, and prior to the filing of said O'Connor application, prior to the date of each of the supposed inventions of said Frederick, and prior to the supposed invention of said O'Connor, and more than two years prior to the filing of each of said applications, substantially the product and process set forth in each of said Frederick patents and said O'Connor patent, were known, used, practiced, invented and on sale by:

The Formica Insulating Co. and its predecessor, Formica Products Co., at Cincinnati, Ohio.,
 Continental Fibre Co., at Newark, Delaware.
 Union Switch & Signal Co., at Swissvale, Pa.
 Dayton Engineering Co., at Dayton, Ohio.
 Westinghouse Electric & Manufacturing Co. at East Pittsburg, Pa.
 D. J. O'Connor of Cincinnati, Ohio, formerly at Pittsburg, Pa.
 Herbert A. Faber of Cincinnati, formerly of Pittsburgh, Pa.
 John M. Thier of Cincinnati, Ohio, formerly of Pittsburgh, Pa.
 L. T. Frederick of Valparaiso, Indiana, formerly of Pittsburgh, Pa.

17. Avers that in view of the general state of the art pertaining to the manufacture of laminated products composed of a fibrous fabric and a binder, and specifically laminated products composed of fibrous fabrics, such as paper, cloth, or the like, and a phenolic

condensation product binder, in view of the general state of the art pertaining to tubes, rods, etc., manufactured from such substances, and in view of the general state of the art pertaining to the manufacture of various forms of articles from such materials, the claims of plaintiff's patents, and each of them, which are charged in the [fol. 17] bill of complaint to be infringed by defendant, were not patentable and are invalid.

18. Avers that the alleged specific inventions set forth in said Frederick patents are substantially anticipated by said O'Connor patent, and the prior inventorship, knowledge and use thereof by said O'Connor and others; and further avers that the later Frederick patent set forth in said bill of complaint is substantially anticipated by the earlier Frederick patent set forth in said bill of complaint.

Defendant, therefore, prays that the bill of complaint be dismissed at plaintiff's costs.

Formica Insulating Company, By Dyrenforth, Lee, Chritton & Wiles, Wood & Wood, Solicitors for Defendant. John H. Lee, of Counsel.

[fol. 18] IN THE DISTRICT COURT OF THE UNITED STATES, SOUTHERN DISTRICT OF OHIO, WESTERN DIVISION

[Title omitted]

HEARING BEFORE HONORABLE JOHN W. PECK, DISTRICT JUDGE, AT CINCINNATI, OHIO, ON SEPTEMBER 23 AND 24, 1921

Appearances: For Plaintiff, John C. Kerr, of Kerr, Page, Cooper & Hayward, New York City; Alfred M. Allen, of Allen & Allen, Cincinnati, Ohio; for Defendant, John H. Lee, of Dyrenforth, Lee, Chritton & Wiles, Chicago, Ill.; J. Edgar Bull, New York, N. Y.; Wood & Wood, Cincinnati, Ohio.

Friday, September 23, 1921.

Mr. Kerr: This suit is on the O'Connor patent, No. 1,284,432, your Honor. As originally brought, it was based on three patents, the O'Connor patent and two patents to a man named Frederick. We [fol. 19] however, withdrew from the suit the two Frederick patents and now stand only on the O'Connor patent, claims 11 and 12.

I offer in evidence a copy of the O'Connor patent in suit, No. 1,284,432.

The copy of the patent so offered is submitted herewith and made part of this record, marked "Plaintiff's Exhibit No. 1."

Mr. Kerr: I also offer in evidence a tube which I will hand to the Court. I have submitted this tube to the defendant's counsel and to Mr. O'Connor, of the defendant company, and they have agreed

to stipulate that the defendant, prior to the bringing of this suit and subsequent to the issue of the O'Connor patent, made and sold tubes like this exhibit, and that these tubes were made by taking sheets of paper coated with a phenolic condensation product known as "Redmanol," rolling the coated sheets up into the general form of a tube, and then moulding them into their present tube form, moulding it, rather, the single sheet into this present tube form by placing it in a form of proper shape and applying pressure and heat, whereby the paper and redmanol are compacted and hardened.

As your Honor will note from the copy of the O'Connor patent, it was issued to the Westinghouse Company, as assignee of Daniel J. O'Connor, Jr., and therefore the title appears to be in the plaintiff.

The Court: Now, if I understand it, the question whether the defendant company is estopped to assert the invalidity of the patent is the first burning question in this case.

Mr. Kerr: It is the burning question, but I thought it would be first necessary to show your Honor that the material we present comes within claims 11 and 12 of the patent. I don't know whether there will be any question of that or not, although Mr. Bull stated there was a question of infringement.

[fol. 20] The Court: I believe defendant denies infringement as well as validity of the patent. Was any reply filed in the case? Was there an issue of estoppel raised in the case in any way?

Mr. Kerr: (Not except what appears in the answer. They deny that claims 11 and 12 are valid, and then they state they were not based on the application as executed by O'Connor.

The Court: Now, you say they are estopped to deny the validity of the patent because O'Connor is a stockholder and officer and member of the defendant company?

Mr. Kerr: And one of the controlling factors.

The Court: Now, where is that raised, that issue of estoppel?

Mr. Kerr: Well, I think your Honor is anticipating a little bit, because I suppose that the proper order of that being raised would be by objection from us when they commence to put in their proof; therefore, I propose to prove infringement and also prove the facts as to O'Connor's relation.

The Court: Can you raise that issue of estoppel unless it is pleaded? I assume that you can, under the present form of equity pleading.

Mr. Kerr: We certainly could raise it if they commenced to put in testimony as to the prior art to show the patent is invalid. And that is where I assume the question will be raised to the Court.

Mr. Bull: Don't you plead estoppel in your bill? I am not familiar with the pleadings. I suppose they had pleaded estoppel in the bill.

Mr. Allen: The answer certainly says they are not estopped, so I suppose the bill says it.

Mr. Bull: It is certainly necessary to plead it. I think there is no question about that.

The Court (after referring to pleadings): I don't see it.

[fol. 21] Mr. Kerr: I don't understand, your Honor, that it is necessary for the plaintiff to plead estoppel as a matter in its bill. We

own this patent and we charge infringement. Now, when we prove our case, when we have put in our patent and made out our prima facie case of infringement, of course, up to that point there is no necessity for discussing estoppel, but it would come up naturally if the defendant relies on the plea of the invalidity of the patent and sets up that the patent is invalid. We say that the defendant has no right, an assignor has no right to say that his patent which he has sold is invalid in the hands of the assignee, and I never understood that it was necessary for the owner of the patent to plead that the defendant is estopped, plead it in his bill. It is up to the defendant to do something to question the plaintiff's right before the plaintiff has to start in to defend that right.

Mr. Bull: I understand the proper practice is—of course, the plaintiff, in the first instance, is not to plead estoppel, but as soon as the defendant puts in an answer denying validity and what not, then plaintiff should come in and put in his bill and plead estoppel. I think that is the proper practice.

The Court: As both sides heretofore stated that that was the issue in the case, I take it that both sides are prepared upon that issue?

Mr. Bull: Yes.

The Court: And in order to do substantial justice, it would be proper to allow an amendment, if an amendment is necessary. Therefore, we will pass that technical point of pleading and let us come to the issue at once, of whether, under the circumstances of the case, there would be an estoppel, assuming infringement be present, and if there is such an estoppel, we may then come at once to the question of infringement.

Mr. Kerr: That was our idea, to bring it up to your Honor in order, and not waste time in any other way.

Mr. Allen: I suppose, then, we ought to call Mr. O'Connor.

[fol. 22] The Court: I suppose there is no question, Mr. Bull, but that he is the Mr. O'Connor who took out this patent?

Mr. Bull: The same Mr. O'Connor.

The Court: Is there any question but what he assigned it to the Westinghouse Company for value?

Mr. Bull: For nominal value.

Thereupon DANIEL J. O'CONOR, JR., called as a witness by the plaintiff, examined by Mr. Allen, testified as follows:

Asked if he and Mr. Faber are not the managing officers of the defendant company, he said they are together with others. But asked whether they two are not the chief officers in control of the policies of the company, he replied that he wouldn't say in control of the policies.

Asked who does manage and control the company, he said there are four of them, Mr. Faber, Mr. D. B. Wallace is secretary, Mr. John L. Best, and himself; that those are four of the five directors; that the fifth director is a woman, and she is not at all active in the company, Mrs. J. G. Tomlin, widow of J. G. Tomlin, who was formerly a director.

Asked if he is one of the chief stockholders in the company, he said he was one of the stockholders, and he asked what Mr. Allen meant by one of the chief stockholders. The Court suggested that he give the proportion of his stock, and he said, a little over one-third; and further said that Mr. Faber owns somewhere around that proportion, and that the other directors own the other third, approximately.

Asked who are the men that are out at the factory, in charge of the manufacture of the product of the Formica Company, he said John M. Thier is superintendent of the factory; and asked who has [fol. 23] control over the superintendent, he replied, the other directors; and asked if he does not direct Mr. Thier, if anything comes up, he said, Mr. Faber and myself.

Answering a series of questions by the Court, he said that he is vice-president; Mr. Faber is the president; Mr. Wallace is secretary and Mr. Thier is superintendent; that they have no treasurer; that Mr. Faber handles the invoices; that there is no general manager of the corporation—no such office as that; and that Mr. John M. Thier is employed as factory superintendent.

Asked by Mr. Allen, if Thier reports to him, witness said, not to him; he reports to Mr. Faber and himself; that there is no set arrangement on that. Some things Thier takes up with Mr. Faber and some things with the witness; some things he takes up with both of them.

He said that Mr. Wallace does not go to the factory every day, but that he (witness) goes most every day.

Asked if it wasn't so that he is there all the time and Mr. Faber is there all the time, and if anything comes up it is referred either to him or Mr. Faber or both of them together, he said, if it is anything of importance they refer it to the other directors, and that they two decide, with the other directors, what shall be done absolutely.

Asked when he and Mr. Faber left the Westinghouse Company, he said he left in 1913, and Mr. Faber left first. He said they two got together in a partnership at that time together with another individual, Mr. J. G. Tomlin, who was a member of that firm. That the concern that they formed after they left the Westinghouse Company was a partnership which was known as the Formica Products Company; and that they started to manufacture, then, these formica or bakelite products.

Afterwards they incorporated as the Electric Service Company. He believes they incorporated for fifteen thousand dollars, and if he remembers correctly, they had about seven thousand to ten thousand dollars paid in capital.

[fol. 24] Asked if he paid in a third of that or more, he said Mr. Tomlin supplied the finances to start the company.

Q. And you and Mr. Faber supplied the management and running of the company.

A. Well, we—Mr. Tomlin supplied the original capital, loaning us a certain amount, equal to one-third.

Q. He loaned it to you?

A. Yes.

Q. And you gave him the stock, or did you keep the stock in the company?

A. It wasn't any stock; it was a partnership.

Q. I mean in the Electric Supply Company?

A. In the Electric Service Company stock was issued.

Q. To him?

A. I believe when the company was incorporated Mr. Tomlin transferred his interests to Mr. Wallace and Mr. Best, who are now interested in the company.

Q. And the rest of the stock was issued to you and Mr. Faber?

A. No, the rest of the stock was treasury stock; we simply had our third.

Q. You each had a third?

A. Yes.

Q. And that company's name was afterwards changed, was it, to the Formica Insulation Company?

A. The Formica Insulation Company.

Q. And the capital stock increased?

A. It has been increasing right along.

Q. What is the capital stock now?

A. Seventy-five thousand dollars.

Q. And of that you own a third?

A. Approximately a third.

Q. Now, this patent assigned to the Westinghouse Electric & Manufacturing Company—when you were there working for the Westinghouse Company it was understood that any inventions that you made in the line of work were to be transferred to the company?

A. I never made any such agreement, no.

Q. Well, that was understood?

[fol. 25] A. Not necessarily understood. I never discussed it with any of my superiors.

Q. Well, didn't you so understand it, that any inventions that you made that they wanted to patent the patent was to belong to the Westinghouse Company?

A. I suppose I understood that, yes, but it was never stipulated in any contract that I had.

Q. Never stipulated, but that was the understanding?

A. As a general rule, in the engineering department—

Mr. Lee: I object to that manner of proof, your Honor. I think the facts ought to be developed, not what may have been understood.

The Court: Well, he said that was the general rule in the engineering department. I think that answer may stand.

Q. And it was under that general rule that when you made this invention the patent application was prepared and you signed it, and at the same time assigned it to the Westinghouse Company, is that correct?

A. Not altogether. It was under a slightly different condition. Up to about 1912 we had not been given any specific instructions to

take matters up with the legal department. Our work in the process section was to write processes and develop processes for the benefit of the manufacturing department, those processes being written up in specification form and delivered to the superintendent for the purposes of the manufacturing department. About 1912 Dr. Baekeland was granted a patent on composite cardboard, and the Continental Fibre Company started into the manufacture of what the Westinghouse Company then thought was an infringement of their Haefely patent, and they also thought that the Baekeland patent had been anticipated by the work done in the Westinghouse Company. The engineers were then given specific instructions to send to the legal [fol. 26] department all processes that were worked on or developed. Among other processes which were written up in specification form was the process of making this micarta plate, and in the routine manner that was sent to the legal department. I heard nothing about it further until the matter was brought down to me to sign and I was given a voucher for one dollar.

Q. Do you know the specifications of this patent? Have you read them?

A. The specifications of that patent are the process. They correspond almost exactly to the process specification which I wrote.

Q. That is the one you signed then and assigned to the Westinghouse Company?

A. I assume that I did that, yes.

Cross-examination:

Asked by Mr. Lee to explain somewhat more in detail the manner in which the Formica Insulation Company and its predecessor, or rather, the predecessor of the Formica Company began and entered upon this business of manufacturing a laminated product, O'Connor said that in the early part of 1913 Mr. Faber made a proposition to witness in regard to going with him in the manufacturing business which he had decided to start, and the suggestion and the offer which he made to the witness at the time, were later on accepted, and that resulted in the starting of the Formica Products Company.

As to what Mr. Faber did with a view to carrying out his ideas, as he recalls it, Faber made several trips to different parts of the country to look over manufacturing sites and to look into the matter or raising finances.

The Court: Are we interested in this part of it, about his going around the country looking for finances?

Mr. Lee: I think we want to show the exact facts of how this business started and how the manufacture was gone into.

[fol. 27] Mr. Allen: We only brought out on direct examination Mr. O'Connor's connection with the Formica Company. We had to go back to show that, it seems to me.

The Court: Well, if there is anything really pertinent, let us get right to it.

Resuming, O'Connor said that Faber, after several efforts, finally succeeded in getting satisfactory arrangements in Cincinnati. He came down here, rented the place of business, purchased machinery, and when the plant was ready to operate they closed their agreement and O'Connor came down here as production man.

Answering further questions by Mr. Lee, O'Connor said he did not have anything to do with the financing of the company; did not have anything to do with the renting of a factory; and did not have anything to do with the installation of machinery at the outset.

Mr. Lee: It is possible that that is as far as I can go on cross examination, your Honor, but I reserve the right to call Mr. O'Connor.

Mr. Allen: I understand that that makes out a *prima facie* case on the patent and the thing infringed, and we rest, with that.

Mr. Lee: We desire to offer in evidence the volume of prior art patents, and we offer this as "Defendant's Exhibit 1, prior art patents."

Mr. Allen: If your Honor please, we object to the offer of these patents.

The Court: That raises the question, I suppose, of whether there is an estoppel.

Mr. Lee: The Court of Appeals in this circuit has held that prior art may be introduced for the purpose of showing the true nature of the invention covered by the patent; also that the file wrapper and [fol. 28] contents may be introduced for the same purpose.

The Court: Yes, they would be admissible on that ground, without regard to the validity of the patent, I take it. Upon the question of infringement, let them be introduced.

Mr. Allen: It has been especially decided, if your Honor please, that you can't, under the guise of showing non-infringement—and there can't be non-infringement if this claim is valid, as they have stipulated that they have formed the tubes according to the claims—now, you can't, under the guise of non-infringement, have a case on that.

The Court: I take it, the point will arise—it is not material at what particular point it arises. Let this be introduced. But, of course, you are offering it only at this time upon the ground of non-infringement, these prior patents?

Mr. Lee: I am offering it for whatever it is worth.

The Court: Then, the question whether it shall be received for all purposes or only for the purpose of showing non-infringement is now before the court. Do you wish to offer any further evidence upon the subject of the alleged estoppel itself?

Mr. Lee: Yes.

The Court: Then this would be a good time to do it.

Mr. Lee: I was about to offer the file wrapper.

The Court: Well, we will just take up the question of estoppel itself. Does the file wrapper bear on that?

Mr. Lee: Yes, sir.

The Court: Let it be introduced.

The volume of prior art patents offered and admitted in evidence [fol. 29] is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 1, Prior Art Patents."

The file wrapper so offered and admitted in evidence is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 2, File Wrapper and Contents, O'Connor Patent No. 1,284,-432."

Mr. Lee: This file wrapper is an uncertified copy furnished by the Patent Office. I take it, there is no objection to the use of an uncertified copy.

Thereupon, HERBERT A. FABER, a witness for defendant, examined by Mr. Lee, testified as follows:

That he is president of the Formica Insulation Company. That the Formica Insulation Company originated thus: He had had in mind during 1912, the idea of manufacturing and he had three separate schemes for separate products in mind, separate industries in mind, and he finally felt that he was better informed in the matter of this particular product in which they finally embarked than any other, and he discussed this with various men that he was in touch with at the time, and finally with Mr. O'Connor. At the same time he was looking about for financial help, and had one man working on that end of it for him, but finally raised the money directly himself, and when this thing was brought up to Mr. O'Connor, after discussing the thing, O'Connor agreed that he would be willing to go with Faber in this manufacturing scheme.

The Court: You were with the Westinghouse Company?
[fol. 30] A. I was with the Westinghouse Company, and I induced a man in Kentucky to finance us completely, and the middle of March, 1913, I came to Cincinnati, rented a building, secured the necessary machinery, and when the shop was fairly well laid out for elementary work, I got in touch with Mr. O'Connor, and he came on to the plant.

By the Court:

Q. As I understand it, you had agreed with O'Connor that he was to go with you before you left the Westinghouse Company?

A. Before I resigned from the company, yes.

Q. Then you left the Westinghouse Company, established the plant—got the money, rented the house and established the plant, then sent for Mr. O'Connor and he came with you?

A. Yes, sir.

Q. That was a partnership at the time?

A. Partnership in the beginning, three of us in it.

Asked by Mr. Lee if the question as to whether Mr. O'Connor was to come with him was fully determined at that time, or did O'Connor have some other project in mind, he said, it was discussed, and he

was expecting O'Connor to come, although, of course, there was no decision until they knew what they were going to do, and where they were going, and whether the money could be raised. It was simply a tentative discussion.

Asked how he was educated, Faber said he graduated from the university, in mechanical engineering, here in Cincinnati in 1906, and then took an apprenticeship course in the Westinghouse Company that lasted two and one-half years, going through the various shops and other departments. That he was raised here in Cincinnati. Explaining how his time was consumed after he left the university up until the time he started this company, he said that in [fol. 31] the apprenticeship course he spent one section of that period in the insulation work, that is, the insulation application to products, and in the division, the section that does that work. He also spent one division of that time in the transforming of engineering design involving insulation; and he was also on an experimental test one section of that time, where machines were tested for all of their properties and characteristics.

Asked what he did after he got through with what might be termed the apprenticeship work; what he did at the Westinghouse Company, he said, there were two periods to that. The first one he was assistant to the manager of the repair department, so-called, which department had charge of the handling of all machinery which came back to the company for repair or which came back for any purpose, came into the company after having been in service. That work involved a certain constant close touch with the insulation problems, as most machinery fails either from insulation failure or bearing trouble, some mechanical trouble. The second period he was in charge of the sale of insulation and similar fundamental products, in which case he was daily called into the factory in order to get proper information to correspond with the salesmen in the field; also going into the engineering department constantly and writing them in reference to problems involving the nature of insulation and its application.

Asked if in his work at the Westinghouse Company he became familiar with the manufacture of shellac micarta under the Haefely process, he said, he was familiar from the beginning with the principles involved in those processes, and, to a degree, with the machines. It was their business, as apprentices, to learn what they could of those processes for their own educational purposes.

Asked if he thus became familiar with the winding of the round tubes by the Haefely process, using the shellac and paper, and also with the manufacture of the square tubes under the Haefely process, he said, he knew of these in principle from his entry into the company, and, of course, this information grew as he stayed with them. He said that those tubes were composed of what was known as shellac micarta or micarta at that time.

Q. State whether, to your knowledge, articles were pressed from laminated shellac micarta?

A. I knew of—

Mr. Allen: If your Honor please, it seems to me he is going now with this witness into the question of the validity of the patent.

Mr. Lee: My purpose is here to show this witness was thoroughly familiar with those processes in practice and was entirely competent to carry on its manufacture, and being familiar with it, he had determined to start to manufacture it himself, and that he was not dependent upon Mr. O'Connor in any way.

The Court: Well, he has already said he knew about the manufacture of shellac micarta, hasn't he?

Mr. Lee: Yes, he has said he was familiar with the manufacture of the square tubes. He hasn't explained just how they were made yet.

The Court: Is that necessary to do in order to show his familiarity with it?

Mr. Lee: These claims have to do with the pressing of these laminated products.

The Court: Ask him if he is familiar with the process involved in these tubes. We don't have to go into the details of it.

A. I was familiar with all the principles of the process.

Faber further testified that he, while with the Westinghouse Company, also became familiar with the manufacture of bakelite micarta, including the round and square tubes that had formerly been pressed from shellac micarta, but he wasn't familiar with corrugated pieces.

[fol. 33] Q. State what was your custom in regard to visiting the manufacturing department, or the department where the bakelite micarta was manufactured during the time that you were in the sales department?

A. It was necessary—

Mr. Allen: If your Honor please, I object to this as utterly irrelevant.

The Court: I will let him answer this question. You went around and saw all that was going on; is that it?

A. That was my business.

Q. And you were familiar with those processes?

A. I was.

The examination continued thus:

Q. Now, please explain the various names under which business has been done by the Formica Company or its predecessors.

A. The Formica Products Company and the Electric Service Company and the Formica Insulation Company.

Q. The Formica Products Company was a partnership, was it?

A. It was.

Q. The money for the venture was furnished by whom?

A. By a Mr. Tomlin.

Q. Give his full name, please?

A. Mr. J. G. Tomlin.

Q. Where did he live?

A. Walton, Kentucky.

Q. How much did he furnish?

A. He furnished all of the money.

Q. What was the amount?

A. We started, I think, with \$7,500.

Q. How did you pay for your interest in the business, you and Mr. O'Connor?

A. Well, Mr. Tomlin supplied the money and we gave notes for such amounts as we took out.

[fol. 34] By the Court:

Q. You owed it to Tomlin and put it in the business; is that the idea?

A. Yes.

Q. Bought machinery and equipment and supplies?

A. With the money.

Q. Then started out to do business?

A. Yes, sir.

Q. Then, afterwards incorporated it for fifteen thousand dollars and took stock for your interest?

A. Took stock representing such amounts as had been paid in.

By Mr. Lee:

Q. Now, in carrying on the business of the Formica Company, along what lines have you and Mr. O'Connor each worked?

A. Well, I have always purchased and designed and built such machinery as we have, and originally I went out for orders, solicited orders. I have been in charge of the finance from the beginning. Mr. O'Connor has followed production.

Q. You attended to the financing of the company?

A. Yes, sir.

Q. In the later period of the business, or rather, after you had gotten started, did Mr. O'Connor remain as a production man, or in what capacity?

A. Well, he changed later to following the sales, and I went more thoroughly into the shop work.

Q. Have any patents been taken, or any applications for patents made by either you or Mr. O'Connor pertaining to your business?

A. Such as have been made, have been made by me.

Q. When the Formica Company or its predecessor, the Formica Products Company, started on this manufacture, what class product did it make?

A. We made a material of paper and a condensation product which was formed into commutator rings.

[fol. 35] Q. Of the nature of the sample that I now show you (exhibiting to witness)?

A. Of that nature.

Q. Those were pressed, were they?

A. They were pressed in presses; yes, in moulds.

Q. And pressed from a laminated product composed of paper and bakelite?

A. Paper and bakelite, yes.

Mr. Allen: I object to the introduction of this evidence.

The Court: I think myself we are getting a good ways from the point.

Mr. Lee: We propose to show as part of our case, if the Court please, that we started on our manufacture immediately, and the Westinghouse Company have known it all the time; that four years after this manufacture they inserted those claims without any authority, in that patent in April, 1917, whereas we started this in 1913, and there was no justification for it; that the Westinghouse Company knew of our manufacture all the time, and it is estopped to come forward now. And I think we have a right to go into the evidence.

The Court: Under that statement of the issues I think we have too, if those are the issues in the case. But they have not been stated before. Is that state of facts set up in your pleadings?

Mr. Lee: If the Court please, the estoppel, of course, is not pleaded in the bill, and we are not pleading an estoppel; we are simply showing our equities. I understand that in an answer it is unnecessary to plead an estoppel. I assume that rule applies to a bill. I wouldn't want to be definite about it.

The Court: No, but you are asserting the invalidity of these claims, as having been added without authority, after the applicant had assigned his interest and left the company. Is that set forth [fol. 36] in the answer?

Mr. Lee: Yes.

Mr. Allen: They set up in the answer that claims 10 and 11 were filed afterwards.

The Court: Now, you wish to show that in the meantime these products were made prior to the time they amended the application?

Mr. Lee: Yes, sir.

The Court: Under that statement of the pleadings, you are entitled to show it.

Asked whether this manufacture of pressed laminated product composed of paper and bakelite was engaged in at the outset by the predecessor of the Formica Company, and whether such manufacture has continued until the present time, Faber said, it has, except the varnish has been changed. In the early days their varnish was purchased from the Bakelite Company, and later they adopted the Redmanol varnish.

By the Court:

Q. What were the dates of that?

A. We used that bakelite pretty well during the first year, 1913, and early in 1914.

Q. You were making this product just indicated in 1913 and 1914, were you?

A. Yes, sir, started in 1913.

By Mr. Lee:

Q. Your bakelite was purchased from the General Bakelite Company?

A. General Bakelite Company.

Q. State whether the Westinghouse Company had knowledge of your manufacture from the outset?

A. They did.

The Court: How do you know that?

[fol. 37] A. I made a number of trips up there to see various men in my immediate line, that is, the man selling the repair parts. He was also very closely allied with the division I had charged of, and we discussed the thing a number of times.

By Mr. Lee:

Q. Do you happen to know when Mr. O'Connor became an officer of the company, the Formica Insulation Company?

A. When we incorporated—no, I beg your pardon—it was considerably after that.

By the Court:

Q. That is, you say they knew of this because you told the man who was in charge of repair parts at the Westinghouse Company, is that it?

A. Yes, sir. Those things are very common property if they are discussed at all in the organization.

Q. Have you any other basis for saying that the company knew about it?

A. We sent out a little advertising leaflet describing this. Now, I don't know just how early that was, but it was very shortly after we were in business, and this leaflet was called to my attention when I got up to the Westinghouse Company by this man, Mr. Miles.

Q. What was his position?

A. He was in charge of the sales of repair parts, including the finished insulating parts; that is, if an insulating part was made for a particular machine, he handled it; if it was in the raw stage, I handled it.

Continuing, Mr. Faber said that until shortly prior to the bringing of this suit, the Westinghouse Company did not make any protest against their carrying on this manufacture; and that at the time another patent came up, the legal department told him that if they [fol. 38] persisted in the manufacture of the other article, they might be called on to bring pressure on them on other patents. He don't remember their mentioning any one in particular. He is referring now to the time when they went into the manufacture of the Formica gear, or rather, began to allow Formica to be used for gear purposes.

Asked if the Westinghouse Company protested strongly against

their doing that, he said they did. Asked if they made a threat that if they did that they would bring other litigation against them, he said they intimidated that.

Asked if it can be shown by reference to the records of the Formica Insulation Company when Mr. O'Connor became an officer of the company, he said, it can, yes. It is in the minutes of the directors' meetings.

Cross-examination by Mr. Allen:

Q. These talks that you had With Mr. O'Connor before you left the Westinghouse Company were had several months before you left?

A. I don't think so.

Q. During the winter?

A. After the first of the year some time, yes. I would say about February.

Q. About February, 1913?

A. Yes.

Q. That was a month, then, as far as you could estimate it?

A. Yes.

Q. A month prior to the time?

A. Yes.

Q. Did I understand you to say that the Westinghouse Company never complained of your making these parts that you have referred to in 1913 and 1914; is that it?

A. I recall no complaint whatever. They were very friendly to us throughout the organization.

Q. They never made any complaint about these parts?

A. Not that I recall.

Q. At that time, and not for several years?

A. Not that I recall.

Q. Do you know when this O'Connor patent was issued?

A. I don't recall.

[fol. 39] Q. It speaks for itself, November 12, 1918. Do you know whether the Westinghouse Company was making parts of this kind at the time?

A. I don't think they were making them commercially. I don't know that they ever made those commercially.

Q. You don't want us to understand that Mr. Tomlin had anything to do with the lines of work that you would take up, or the purchasing of machinery, or any of the acts of actually doing business, do you?

A. Supervisory only.

Q. You and Mr. O'Connor decided on those various things?

A. Yes, if they were minor.

Q. If what?

A. If they were minor, if it did not involve anything of weight.

Q. Now, in the actual business, you mean, the machinery that should be purchased and what lines of business you should go into, and what things you should take up, did you consult Mr. Tomlin about that?

A. Only in the important cases; in the important cases only.

Q. What would you mean by an important case?

A. Such a case as diverging somewhat from our regular course, the adoption of another product, or the increase of the scope of the product, or anything of that sort.

Redirect examination by Mr. Lee:

Q. Such a product as has been offered in evidence by plaintiff here as an example of defendant's product, that is, where the varnish coated paper is wrapped into a tube and the tube is pressed in dies, who originated that practice, as far as you know?

Mr. Allen: I object to that. That is certainly going to the validity of the patent. Now, if your Honor please, this action is brought merely because O'Connor had sold this patent to the Westinghouse [fol. 40] Company and on the theory that he had no right, having sold it and taken the consideration for it, then to go out—he said he was an inventor, and described his invention and assigned it to the Westinghouse Company—that he has no right to go out and associate himself with another party and go into the business of making the thing which is covered by the patent which he sold. That is the issue, whether he and this company represented by him have that right; and that is the only issue that we want in this case.

The Court: What is the point of this question?

Mr. Lee: We propose to show that this material that they are now charging as an infringement was first made, and in fact, was originated by the Formica Insulation Company several years after they left the employ of the Westinghouse Company, and that that is nothing that the Westinghouse Company knew of, or, in fact, knew how to make, and that it was within the scope of O'Connor's invention, and that the patent has been distorted by an unauthorized amendment, and that they are now seeking to apply those claims which they wrongfully introduced to a product which we originated several years after leaving the Westinghouse Company.

The Court: He may answer the question.

A. That was originated in the Westinghouse—or in the Formica Insulation Company, I should say.

By Mr. Lees:

Q. Can you produce written evidence to show when the Formica Company developed and placed this product on the market?

A. I think we have invoices billing that material out.

[fol. 41] The Court: What exact material do you refer to now—such as the tube in evidence?

Q. Plaintiff's Exhibit, yes. State whether the formica Insulation Company, or rather, how early the Formica Insulation Company made tubing by rolling the paper into a tube, that is, bakelite coated paper, into a tube and pressing into that form of product.

Mr. Allen: I don't want to continually object, but I don't see why we can't get the real issue.

The Court: I recall nothing of this sort, that was asked about in cross examination.

Mr. Lee: Of course, I put the witness on.

The Court: He has been cross-examined, and this is simply a re-direct examination directed to the cross examination.

Mr. Lee: I will ask leave to recall the witness when we get the invoices and whatever else may be necessary to show the dates.

The Court: Very well.

Deposition closed.

DANIEL J. O'CONOR, JR., as a witness on behalf of defendant, testified further, being examined by Mr. Lee:

That he entered the employ of the Westinghouse Company in 1907, at a salary when he started there, of sixteen cents an hour.

The Court: How are we interested in that?

Mr. Lee: I wish to show that the Westinghouse Company was accustomed to hold forth as a part of the payment or the consideration which its employees received in the research department and in [fol. 42] those various departments, that the information which they were getting there, the education which they were getting there was part of the consideration to be given for the services.

The Court: Do you draw that as an inference from the small salary, or because there was a definite agreement?

Mr. Lee: Because it was so understood.

The Court: Ask him about the understanding, would be a good way to get at that.

Asked what was the understanding which existed between him and the Westinghouse Company, he said the inducements which the Westinghouse Company offered them as engineers when they complained of the small salary which was given them was the fact that in addition to the small compensation which they received they were allowed to work in a department where they came in contact with engineers of considerable experience and education, and they also had the privilege of working on new developments and thereby gained a good deal of experience. In other words, they were getting something of the knowledge that an apprentice gets in learning his trade. That was the understanding.

Asked whether, prior to the time the Westinghouse Company took up the manufacture of products involving the use of bakelite, it was accustomed to make or to press laminated shellac micarta in various forms, he said, yes, it was.

Asked what the sample is which is now shown him, he said that is one of the forms of shellac micarta that was used in the Westinghouse equipment, made from laminations of shellac and Kraft paper. This is not a piece that was made by the Westinghouse

Company, but it is a similar piece. Asked if that was prior to the time the use of bakelite was taken up, he said he knew they used this as early as 1908 and 1909.

Mr. Lee: We offer that as Defendant's Exhibit No. 3, Corrugated Shellac Micarta.

[fol. 43] Mr. Allen: I object to that, if your Honor please. If it has any bearing it is to show the validity of this patent.

Mr. Lee: It may bear on the scope of the patent.

The Court: I suppose this is offered to show the extent of the witness's information legitimately acquired in the Westinghouse Company, which I suppose it is claimed he was entitled to employ in any subsequent business. Is that the purpose?

Mr. Lee: Yes, your Honor; also as a part of the prior art.

The Court: That doesn't quite reach the issue, it seems to me. To show that he was skilled in an analogous and kindred art and entitled freely to use his skill and knowledge and experience would not be to say that he was entitled to transfer a patent and then deny its validity. I don't quite see that that reaches the issues which are now before us.

Mr. Bull: We are entitled to avail ourselves of the defense of non-infringement. In order to determine what is the proper scope of claim it is necessary to know the prior art.

The Court: We are getting to another thing now, Mr. Bull. It was the understanding of the Court that the order of procedure was to be to try this question of estoppel first. Now, if we direct ourselves to all the issues in the case, of course the entire prior art is then in issue and is quite proper, and it may be that it would be better, that the questions are so intermingled that it would be better to try the entire case and hear argument upon all issues, rather than trying to segregate the issue of estoppel and try that first. What do you think about that, Mr. Allen?

Mr. Allen: The only reason I thought we could try that is because that was all there was in it. There wasn't any question of infringement.

Mr. Bull: There is.

The Court: These gentlemen make the issue of infringement. They say there is an infringement.

[fol. 44] Mr. Bull: I think you will agree when you hear my argument.

Mr. Allen: The claim reads directly on this.

Mr. Bull: My dear boy, do you remember the case of Westinghouse vs. Boyden, in which the Supreme Court said that didn't make any difference?

The Court: Well, now, colloquies between counsel aside, I think probably. The answer denies infringement, does it not?

Mr. Bull: Yes, your Honor.

The Court: The issue is then formally made on the pleadings, and counsel for defendant say they expect to support that issue; therefore the question is here, and I think perhaps we had better proceed upon the entire issue and hear the argument upon all phases of the case, rather than trying to separate them as we go along.

Mr. Bull: My understanding is that our proofs are very, very simple in this case. I understand that all we are going to prove, so far as the facts are concerned, are that these claims are for nonplaniform material which has been pressed; and nonplaniform material I understand to be anything except a flat plat. So these claims are for anything except a flat plate which is made of this laminated bakelite material pressed in that form. Now, we are simply going to show, as I understand it, that nonplaniform materials made of shellac were old, and they adopted bakelite as a substitute for shellac under the advice of Mr. O'Connor, and when they adopted it, then they used bakelite in these products instead of shellac and they pressed them in exactly the same way, and rolled them up in exactly the same way, and did everything with them in exactly the same way. I think that is all we are going to prove. I may be mistaken.

The Court: Let us get it in about as concise a way as we can. Omit the summing up questions, and the "in other words" questions, and the obvious questions, and let us get right at the issue in this case.

[fol. 45] Mr. Lee: I think if it goes through without objection that I can get it in very quickly.

The sample of Corrugated Shellac Micarta offered by counsel for defendant is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 3, Corrugated Shellac Micarta."

Asked by Mr. Lee what the sample is which is now shown to him, the witness said that is the same class of piece, the same shape, made in the same equipment and with the same kind of paper, but a different bond, the bond being redmanol. That is a Formica product.

Counsel for defendant offered in evidence the product identified by the witness, and the same is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 4, Corrugated Formica."

Asked how long that has been manufactured by the Formica Company, he said that is not manufactured by the Formica Company. It was manufactured for this case.

Asked by the Court if the Formica Company ever make it, he said not that particular shape; they have made similar shapes.

Asked what is the purpose of it here, he said as he understands it, that is one of the specific shapes that were used in large quantities by the Westinghouse Company in 1908, 9 and 10. It is merely an example of what was done in the way of nonplaniform moulding from shellac material.

Asked by Mr. Lee what the product is which is now shown to witness, he said this is a shellac micarta tubing, similar to what was made by the Haefely process prior to the use of bakelite at the Westinghouse plant.

[fol. 46] Asked what the product is which is now shown to witness, he said that is bakelite micarta tubing, a sample of a tube made

with shellac and paper; and that he understands that was made by the Westinghouse Company and sent to Mr. Lee.

The Court: What is the purpose of this?

Mr. Lee: The purpose of it is to show that this is a part of the prior art that we expect to offer here to show the scope of these claims.

The Court: These were made when?

Mr. Lee: Made prior to 1910.

Mr. Allen: The witness doesn't say so.

Mr. Lee: We have your stipulation, Mr. Allen.

The Court: It was stipulated that this was made prior to 1910?

Mr. Lee: I have the stipulation but did not intend to offer it. To save time I wanted to ask the witness.

The Court: I wanted to understand as we go along.

Mr. Kerr: May I ask about that tube?

Mr. Lee: These are the ones you furnished me as similar to the Wappler patent.

Mr. Kerr: In connection with those depositions which we stipulated in we furnished them with certain samples which the witness said, I believe, were like the ones made in 1910—made lately but are fair samples of what were made in 1910.

The Court: This square one is another of the same thing, that you were about to offer?

Mr. Lee: I hadn't offered them yet. I would like to now. The micarta tubing, round tubing, identified by the witness is offered as "Defendant's Exhibit 6-S, Shellac Micarta Tubing (Round)."

The second round tubing is offered as "Defendant's Exhibit 6-B, Bakelite Micarta Tubing (Round)."

[fol. 47] The two exhibits offered by counsel for defendant are submitted herewith and made part of this record, marked as indicated.

Asked what is the square-shaped tubing sample which is now shown him, witness says this is a square shellac micarta tubing, and that this was made as early as 1906 and 7.

Counsel for defendant offered the exhibit so identified by the witness, and the same is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 7-S Shellac Micarta Tubing (Square)."

Asked what is the product which is now shown him, witness says that is an example of a square bakelite micarta tubing that was made from 1910 on.

Counsel for defendant offered the product so identified by the witness, and the same is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 7-B, Bakelite Micarta Tubing (Square)."

Asked what are the samples now shown him, witness says, shellac micarta plate.

Counsel for defendant offered in evidence the product so identified by the witness, and the same is submitted herewith and made part of this record, marked "Defendant's Exhibit 8-S, Shellac Micarta (Cardboard)."

The Court: What is the evidence about that? Is it in the deposition, or stipulation, or what?

Mr. Lee: The testimony of the witness is that the shellac tubing was made prior to 1910.

[fol. 48] The Court: No—these plates. What is the evidence about that?

Mr. Lee: Also, these plates were made about that time.

The Court: You mean this witness testified about them?

Mr. Lee: No, the depositions. Those depositions, if the Court please, we were not intending to offer here. We were going to try and take a short cut.

The Court: There is no use putting these plates in unless we know what they are and something about them.

Mr. Lee: This witness knows they were made about that time, and Mr. Kerr, I think, is willing to admit it.

The Court: That shellac micarta plates were made by the Westinghouse Company about 1910? That is correct, is it?

Mr. Lee: Prior to 1910.

Mr. Kerr: I understand we are still referring to those exhibits that were referred to in the Wappler deposition?

Mr. Lee: The ones that you furnished me.

The Court: Let us proceed.

By Mr. Lee:

Asked what are the samples which now shown him, witness says, these are samples of moulded redmanol, and exemplify a product produced by moulding a compound composed of Redmanol and various fibrous fillers, principally wood flour.

Counsel for defendant offered in evidence the three products referred to, and the same are submitted herewith and made part of this record, marked "Defendant's Exhibit No. 9, Moulding Compound Product," "Defendant's Exhibit No. 10, Moulding Compound Product," "Defendant's Exhibit No. 11, Moulding Compound Product."

[fol. 49] The Court: Now, when were these made? What is the evidence about that?

Mr. Lee: Those were made very recently. We are offering them merely as typical of moulded products which go back of 1910.

The Court: Well, now, how do we know they go back of 1910?

Mr. Lee: I will produce evidence, or I will ask Mr. Kerr to stipulate. I have the Baekeland papers describing these products.

The Court: Is it agreed that these were common in 1910?

Mr. Allen: The moulded products, that is.

Mr. Kerr: I understand they were made lately but to show something that might have been made in 1910.

The Court: Such things were made in 1910.

Mr. Lee: And prior to 1910.

Asked by Mr. Lee what is the sample which is now shown him, he says, samples of laminated mica and shellac in the form of tubing, made prior to 1913. Asked if that is a Westinghouse product, he said they have been made since 1902.

By the Court:

Q. Now, those redmanol products were not made by the Westinghouse Company from Redmanol, were they?

A. They are being made now by the Westinghouse Company with redmanol.

Q. They were said to go back to 1910; you don't mean they made a redmanol compound back to that time?

A. I don't know how far the redmanol compound goes back. I know they made them from bakelite.

Mr. Lee: The bakelite products go back to 1910. These were made to show some of the products that were known to them in 1910.

[fol. 50] Counsel for defendant offered in evidence the last product referred to by the witness, which is submitted herewith and made part of this product, marked "Defendant's Exhibit No. 12, Shellac-Mica Products."

Asked what are the samples now shown him, witness said these are sections of and examples of complete commutator rings made by the Formica Products Company in 1913 using paper and bakelite. These were made in 1913. The Formica Company has continued to manufacture that class of product, only using redmanol and paper without interruption, and still does.

Counsel for defendant offered in evidence the product so identified by the witness, and the same is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 13, Defendant's 1913 Products."

Asked what is the sample now shown him, he says, that is a square shaped Formica product, manufactured in 1914 from paper and redmanol.

Counsel for defendant offered in evidence the product so identified by the witness, and the same is submitted herewith and made part of this record, marked "Defendant's Exhibit No. 14, Defendant's 1914 product."

Asked if the Formica Company continues to manufacture that class of product, he said it continues to manufacture products of non-planiform shape.

Asked if he has any means at hand for fixing the date when the Formica Company began manufacturing tubing of the character which has been introduced by plaintiff, Plaintiff's Exhibit No. 2,

[fol. 51] witness said, they have available some orders and copies of invoices, together with customer's drawings; that he has them, but did not know they were going to be called for this afternoon, and they are in that folder (indicating), and it will take him some little time to collect it.

Mr. Lee: Will that be admitted by plaintiff's counsel?

Mr. Allen: Will what be admitted?

Mr. Bull (addressing witness): When did you make these?

A. Why, we made tubes in 1913, paper and bakelite.

By the Court:

Q. How are those tubes made?

A. That is made by rolling the paper on a mandrel dry and then placing it in a two-piece mould under heat and pressure, allowing the resin to soften during the pressing operation and then to harden under heat and pressure.

Q. It is wound on a mandrel?

A. Wound on a mandrel, then placed in a two-piece mould, each half of the mould representing one-half of a circle.

Q. Why is it necessary to mould it after winding it on a mandrel?

A. Why, this tubing is wound cold. In other words, that is an exact equivalent of the plate material, made in the same way as a plate material except moulded into a shape instead of a flat piece.

Q. That is, the heat and pressure are not applied during the winding process?

A. During the assembling operation—no.

Q. When you say that the Formica Company made these tubes in 1914 you mean made them in that way?

A. We made them in that way.

Mr. Bull: If your Honor please, Mr. Lee seems to think we ought to prove this by documentary evidence. It seems to me unless the [fol. 52] other side wish us to prove it by documentary evidence—(To counsel for plaintiff): Do you wish us to produce documentary evidence?

Mr. Allen: No.

Mr. Lee: That is what I wanted, a stipulation of acquiescence. Let it also be stipulated that Mr. Faber, if called, would testify that this tubing was made by the wrapping and pressing process in the latter part of 1913.

Mr. Allen: That is what this witness says?

A. That tubing was only made in small sizes by that method. For larger sizes other methods are necessary.

Mr. Kerr: The patent was applied for in 1913.

Mr. Allen: And that is the exact method set forth in claims 11 and 12 of the O'Connor patent?

A. I really don't know.

Mr. Lee stated that he noted in the file wrapper and contents of the application for O'Connor's patent which is involved in this suit

that in an amendment dated April 23, 1917, claims were introduced into the application which correspond with claims 11 and 12 of the patent in suit, and asked when he first become cognizant of the fact that claims of the character of claims 11 and 12 were introduced into his patent, and O'Connor replied, about a year ago, at the time of the discussion of the Conrad patent suit. He also said that during the prosecution of the application in the Patent Office amendments were not submitted to him at any time; and that he was never requested to make a supplemental oath to his application.

Cross-examination by Mr. Allen:

Q. Is this Exhibit No. 2, Mr. O'Connor, made by taking a sheet of fibrous material that has been treated with redmanol, and wound cold on a mandrel, is that the way you do the first step in the process?

A. I described that.

[fol. 53] Q. That is right, is it?

A. Approximately.

Mr. Bull: Answer the question.

The Court: Answer the question.

A. Yes, that is correct.

Q. And that redmanol material is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition, isn't it?

A. If it is properly handled, yes.

Q. Then this tube, when it is wound cold in that way, is then moulded by means of a form of the proper shape while applying pressure and heat?

A. I wouldn't call it moulded because there is no moulding done. Moulding, I would say, implies plastic material which flows. This does not flow. This simply hardens under heat and pressure. The general shape is not changed I understand moulding means to take a plastic mass and subject it to pressure in a mould in a form in which you want to get the finished article, and to cause the plastic mass to flow. I would call that (indicating exhibit) pressing not moulding.

Q. What is the difference between a moulded tube and a wound tube of this character of material?

A. I don't know what you mean by a moulded tube unless you would refer to a tube made of such a compound as those redmanol pieces are made of.

Q. Isn't this tube called a moulded tube in the trade?

A. In the trade it is called a moulded tube, yes, but we don't call it a moulded tube from our point of view.

Q. That is the trade name for it, a moulded tube?

A. Our name for it is a pressed tube.

Q. I mean the trade name for it is a moulded tube, isn't it?

A. The Continental Fibre Company's name for it is a moulded tube, yes, but I wouldn't say the Continental Fibre Company is the trade.

[fol. 54] Q. It is commonly known as moulded tubing, isn't it?

A. It is commonly known as pressed tubing.

Q. And not as moulded tubing?

A. Our customers would ordinarily order it as moulded tubing.

Q. To be moulded, a material must be hot material, as I understand it?

A. There is a great deal of cold material moulded. It must be plastic.

Q. And this not being plastic it is not moulded?

A. I would not call that an exact plastic. There is compression there, but there is very little flow.

By the Court:

Q. You say this is not moulded because it does not get its shape from the mould?

A. No, it is merely compressed in the mould and allowed to harden in the mould. It gets its shape from being wound on the mandrel.

By Mr. Allen:

Q. Doesn't it get its shape from the mould?

A. No. There is a piece that gets its shape from the mould—take one of those commutator rings (indicating).

Q. That is not made of laminated material, is it?

A. Yes, that is made of laminated material.

Q. Only with shellac?

A. No, that particular piece is made with bakelite.

Q. Do I understand you to say that that material there is made of laminated sheets that are treated with bakelite first and then placed in a mould and subjected to heat and pressure?

A. That is correct.

Q. Take a tube of this diameter (indicating)? What diameter is the cold rolled material as it comes from the mandrel?

A. I couldn't say.

Q. Well, what diameter—in making those tubes like that exhibit is made, what is the diameter that usually has an inch in diameter when it is completed?

[fol. 55] A. I could not say in tubing. I know in plate if you take a thickness of one inch of the cold paper it usually compressed down to about a half inch in the final product.

Q. And that is true in the tubing?

A. Not in the diameter. It would be true of thickness of the wall, probably—not in diameter.

Q. The thickness of the wall is reduced half, then?

A. I wouldn't say positively. I only know the plate; the other is approximate.

Q. How about a rod?

A. I could not say in the case of a rod, either.

Q. It is reduced in diameter in these presses, isn't it?

A. Naturally.

Q. And reduced quite a percentage?

The Court: I think we have gotten substantially to the end of it. It is reduced under pressure.

Mr. Allen: Reduced substantially is what I wanted to bring out.

The Court: I think the evidence shows that.

Mr. Lee: We were going to call Mr. Faber to show merely that it was old to press these laminated pressed shellac and paper products in non-planiform forms at the Westinghouse plant prior to the year 1910. I understand that to be conceded.

Mr. Allen: That is all right.

Thereupon the witness, Dr. J. O'Connor, retired from the witness stand.

Mr. Lee: I understand that to be conceded, and therefore we won't call Mr. Faber. I understand counsel concedes that Mr. Faber would so testify.

Mr. Allen: Shellac products.

Mr. Bull: I think that is our case, your Honor.

The Court: Plaintiff's turn.

Mr. Lee: I wanted to ask Mr. O'Connor another question.

The Court: What was that?

[fol. 56] Mr. Lee: Bearing upon the question of the knowledge of the Westinghouse Company as to the manufacture of these Formica products.

By Mr. Lee:

Q. Do you know whether the Westinghouse Company had knowledge of your manufacture in 1913, and from that period on to the bringing of this suit of these laminated products manufactured by the Formica Company and its predecessors?

A. I do.

Mr. Allen: I want to object to that question.

The Court: Isn't that the same thing we had before?

Mr. Lee: With Mr. Faber.

Mr. Allen: And for the further reason that this patent was issued November 12, 1918. How could the Westinghouse Company make any objection for infringing the patent before it was issued? He was going back five years.

The Court: I understand their contention is that certain claims were put in without authority; that because they knew they were making certain things the claims were put in an old application to cover what they were making. As I understand, that is the question they are now asking him. I think the question is poor in form. You can't ask one man what another man knew. You can ask him what sources of information the other man had, or what he read, or what was said to him, and what he did.

Asked by Mr. Lee if knowledge of the manufacture of these products by the Formica Company and its predecessors was brought to

the attention of the Westinghouse Company, to his knowledge, O'Connor said it was brought to the attention of Mr. Skinner, the head of the research engineering department, by him in 1913, and [fols. 57 & 58] he discussed the question of their manufacturing those particular products with Skinner. They also advertised in a full page advertisement in the Electrical World to the effect that they were manufacturing in 1913 laminated commutator rings.

Asked if he ever made any inquiries as to whether the O'Connor patent was being prosecuted, he said he wrote to Mr. Mace, one of the assistants in the legal department, and asked him if there were any developments in that patent application, and Mace replied that the patent application was being prosecuted in the usual manner, and that is all that he heard.

Asked what, during the years of manufacture carried on by his company the relations were between the Westinghouse Company and his company, he said the relations were very friendly until Westinghouse attempted to stop them from manufacturing a material suitable for gears; they had access to the Westinghouse factory and were very friendly with the heads of departments and the engineers.

Asked if, when Formica's laminated product began to be used for gear purposes there was some discussion as to the question of litigation, he said that was discussed by Mr. Faber. He can only testify from hearsay.

Testimony closed.

(Here follow exhibits,
Marked side folio pages 59-258,
Inclusive)

U.S. D.C., S.D. of Ohio, W.D.

Westinghouse E. & M. Co. v. Formica Ins. Co.

Equity No. 214.

Plaintiff's Exhibit O'Connor Patent in Suit.

UNITED STATES PATENT OFFICE.

DANIEL J. O'CONNOR, JR., OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

PROCESS OF MAKING COMPOSITE MATERIAL.

1,284,432.

Specification of Letters Patent. Patented Nov. 12, 1918.

No Drawing.

Application filed February 1, 1913. Serial No. 745,618.

To all whom it may concern:

Be it known that I, DANIEL J. O'CONNOR, JR., a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Processes of Making Composite Material, of which the following is a specification.

My invention has particular reference to methods of manufacturing composite materials, such as cardboard.

One object of my invention is to provide an insulating material which is light, strong, and insoluble and has a high dielectric strength.

Another object is to provide a simple and efficient process of producing an insulating material of the above-indicated character in large quantities as a commercial product.

Heretofore, insulation material such as cardboard, composed of layers of paper glued together, has proved more or less unsatisfactory because of various defects, such as absorption of moisture from the atmosphere, inability to resist heat and chemical action, and lack of physical strength. Insulating material to be used in connection with switchboards and wireless telegraph and other high voltage installations, must be free from these defects, and, in addition, must possess high dielectric strength. My invention provides a process of manufacturing an insulating material possessing these qualities in a high degree.

In carrying out this process, any suitable fabric, such as paper, muslin, or other cloth, and fibrous or porous material of any kind may be used. If paper is used, the fabric preferably barren paper, kraft paper or the so called micafolium paper which has a coating of mica flakes, of any desired thickness, is first coated on one side with an adhesive liquid insulating material, suitably that known as bakelite and consisting of a condensation product of phenols and formaldehyde. The coating operation is performed by passing the paper between two rollers, the bottom one of which dips into the liquid material which is contained in a tank. The thickness of the coating retained by the paper is regulated by varying the distance between the two rollers and by altering the viscosity of the liquid. The paper is then dried by passing it over a series of rollers

per is cut into sheets of any desired size but, for convenience, preferably 18"x36" or 36"x36", as desired. A plate is built up to the required thickness by placing the sheets together with the untreated side of each sheet next to the treated side of the adjacent sheet, the number of sheets required for any desired thickness of finished material having been previously determined. The upper sheet is preferably placed with its treated side down, in order that both the top and the bottom of the finished plate will present untreated faces.

The built-up plate is then placed between thin sheet steel plates on which has been rubbed a small amount of machine oil. Any desired number of the steel plates carrying the sheets of paper are placed between the platens of a hydraulic press which have been previously heated, preferably by steam. The press is closed and pressure applied, which may be as high as 800 pounds per square inch, or approximately, 535 tons on an area 36"x36". Satisfactory results have also been obtained by using lower pressures. Heat is applied, preferably by steam, while the material is in the press. The pressure is kept constant during the period of heating and the subsequent period of cooling. These periods are varied according to the thickness of the plate approximately in accordance with the following table:

Thickness of plate.	Time under steam.	Time of cooling.
Up to 1/4"	15 min.	10 min.
1/4" to 1/2"	30 "	15 "
1/2" to 3/4"	45 "	20 "
3/4" to 1 1/4"	1.00 hr.	25 "

The effect of heating and pressing the plate is to firmly cement together the sheets of paper and to further impregnate the paper with the bakelite. The plate is transformed into a hard and compact mass.

After cooling, the plates of insulation are removed from the press and then clamped between steel plates to prevent warping during baking, which is the last step in the process and which is employed for the purpose of removing any moisture remaining in the insulation and for transforming the bakelite completely into its infusible and insoluble condition. The plates are then placed in ovens, air pressure of approximately 140 pounds per square inch is ap-

tween 100° and 140° C. The air pressure may be omitted if the plates are clamped sufficiently tight. These conditions are maintained for approximately eight hours, during which time any remaining moisture is expelled. The plates are then removed from the oven and the finished product is allowed to cool.

While the process above described is that used for making plates, the insulating material may be produced in the form of channel pieces or tubes that are cylindrical or rectangular in cross section or of other shape, as desired, by pressing in forms of the proper shape.

The resultant material has a specific gravity of approximately 1.25. It is practically non-absorbent, even when soaked in hot water, and is insoluble. Consequently, there is no tendency for any given structure of this material to change its dimensions when subjected to moisture or atmospheric conditions. The ordinary reagents have no appreciable effect under ordinary conditions. The substance will withstand a constant temperature of 150° C. without deterioration and up to 300° C., if temporary. The tensile strength of this insulating material is approximately 20,000 pounds per square inch, which exceeds that of wood, fiber and other similar materials. The material is very hard, having an average of more than 40 by the Brinell test. It can be turned and bored in the same manner as wood, adapting it for various shapes and purposes. In addition to the above named qualities, the dielectric strength is high, averaging 820 volts per mil. for plates $\frac{1}{8}$ " to $\frac{1}{4}$ " in thickness.

While I have described the process in full, it is obvious that the details thereof above given may be varied as conditions require, without departing from the spirit of my invention.

It is particularly understood that the term "fabric," as used in the specification and claims, is not limited to paper, which is described and claimed specifically, but is used in its broad sense to include muslin, or other cloth, asbestos, or any other fibrous or porous material.

I claim as my invention

1. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a phenolic condensation product, superposing the coated sheets, applying heat and pressure to the superposed sheets, and then applying a greater degree of heat and a lower pressure.

2. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a phenolic condensation product, superposing the coated sheets successively heating and cooling the superposed

sheets while under relatively high pressure and then heating the resulting plate while under relatively low pressure.

3. The process of manufacturing insulating material which consists in superposing sheets of paper coated with a phenolic condensation product, applying to the sheets of paper a pressure between 100 lbs. and 200 lbs. per square inch and applying heat while the pressure is maintained, cooling the plate thus formed, and then applying an increased heat to the plate while under pressure.

4. The process of manufacturing insulating material which consists in superposing sheets of paper coated with varnish containing a phenolic condensation product, applying thereto a pressure of 100 lbs. to 800 lbs. per square inch, heating and cooling the plate thus formed, while under said pressure, and then heating to a temperature of 100° to 170° C., while under pressure.

5. The process of making a laminated composition that comprises treating a plurality of sheets of fibrous material with a phenolic condensation product, superposing the treated sheets, stacking a plurality of oiled metallic plates alternated with sets of the said superposed sheets, subjecting the stacked material to heat and pressure, cooling the stacked material while under pressure, and baking the composite sheets.

6. The process of making a laminated composition that comprises treating a plurality of sheets of fibrous material with a varnish containing a phenolic condensation product, drying the treated sheets, superposing the said sheets, stacking a plurality of oiled metallic plates alternated with sets of the said superposed sheets, subjecting the stacked material simultaneously to heat and to pressure not substantially exceeding 800 pounds per square inch, cooling the stacked material under pressure, and thereafter heating the composite material under lower pressure.

7. The process of making a composite product that consists in applying to each of a plurality of sheets of fibrous material an adhesive material that is capable of being solidified by heat and pressure, superposing the treated sheets, applying heat and pressure to the superposed sheets, and then applying a greater degree of heat and a lower pressure.

8. The process of manufacturing a composite product which consists in superposing layers of coated fabric, simultaneously heating and pressing the said layers, cooling the material thus formed and again subjecting the material to pressure and heat.

9. The process of manufacturing a composite product which consists in superposing a plurality of sheets of fibrous material associated with a phenolic condensation

product, applying heat and pressure to the superposed sheets, discontinuing the said heating and pressing step and subsequently applying a lower pressure and a greater degree of heat to the product of the first heating and pressing step.

10. The process of manufacturing a composite product which consists in superposing a plurality of sheets of fibrous material associated with an adhesive material that is adapted to harden under the influence of heat and pressure, applying heat and pressure to the superposed sheets, discontinuing the said heating and pressing step and subsequently applying a lower pressure and a greater degree of heat to the product of the first heating and pressing step.

11. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with an adhesive substance that is adapted to harden under the influ-

ence of heat and pressure into a substantially infusible and insoluble condition, and molding the superposed layers by means of a 25 form of the proper shape while applying pressure and heat to compact and harden the materials.

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to 35 compact and harden the materials.

In testimony whereof, I have hereunto subscribed my name this 30th day of January, 1913.

DANIEL J. O'CONOR, JR.

Witnesses:

B. B. HINES,

M. C. MEER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

S. O. BROCK.
Manufacture of Cornices.

No. 159,494

Patented Feb. 9, 1875.

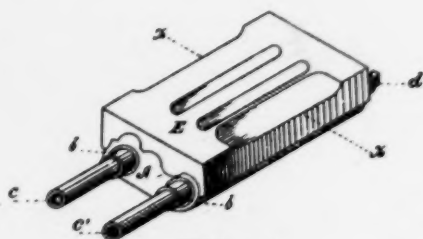


Fig. 1.

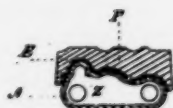


Fig. 2.



Fig. 3.

WITNESSES:
Samuel Oliver
H. C. Martineau

INVENTOR:
Simon O. Brock,
Per O. A. Shaw,
ATTY.

UNITED STATES PATENT OFFICE.

SIMON O. BROCK, OF WATERTOWN, MASSACHUSETTS.

IMPROVEMENT IN THE MANUFACTURE OF CORNICES.

Specification forming part of Letters Patent No. 159,494, dated February 9, 1875; application filed January 5, 1875.

To all whom it may concern:

Be it known that I, SIMON O. BROCK, of Watertown, in the county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Cornices, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which my invention appertains to make and use the same, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 is an isometrical perspective view of the mold in which my improved cornice is formed; Fig. 2, a transverse section of the same, taken on the line *x x*, Fig. 1; and Fig. 3, a sectional view of the cornice.

Like letters of reference indicate corresponding parts in the different figures of the drawing.

My invention relates to that class of cornices which are composed of fibrous or semi-fibrous materials, and molded or pressed into form, ready for use; and consists in a novel construction and arrangement of the parts, as hereinafter more fully set forth and claimed, by which a better article of this character is produced than is now in ordinary use.

In most cornices of this description the substance of which they are formed is homogeneous throughout, frequently causing an absorption of moisture, and giving the parts a tendency to assume their normal position after being molded or pressed into shape. My invention is designed to obviate these difficulties and objections; and to that end, I construct the cornice in a manner which I will now proceed to describe.

To prepare the blank or material from which the cornice is made, I take a thin layer or veneer of wood, and glue or cement it firmly to a layer or sheet of paper or card-board, and back the paper with another thin layer or veneer of wood firmly cemented thereto, or in such a manner as to bring the paper in the center of the blank, or between the veneers when the blank is finished. In cutting

the veneers, and arranging the same in the blank, care must be taken to have the grains of the same run in opposite directions—that is to say, the grain of the face-veneer should be so laid as not to correspond with that of the back-veneer—by which the tendency of the parts to warp and regain their original form after being molded will, in a great measure, be counteracted. After the blank is prepared, as described, the cornice is molded by means of a heated die-press, one form of which is shown in Figs. 1 and 2, consisting of the body *A*, having the cavity *x*, into which steam is passed for heating purposes by means of the pipes *c c*, through the connections *b b*. The top of the body *A* is shaped to conform with the design or configuration of the cornice it is desired to produce, and a cap or die, *E*, corresponding on its lower face with the upper surface of the body, is fitted to the same, forming a matrix, in which the blank is placed and molded under pressure, as shown in Fig. 2, in a manner which will be readily understood by all conversant with such matters without a more explicit description. The blank should be slightly steamed before being pressed or molded; and it is preferable to use a water-proof cement in uniting the veneers to the paper.

I have found that a cornice having its center formed of paper, as described, is less susceptible to moisture than one composed entirely of wood.

Having thus described my improvement, what I claim is—

As a new article of manufacture, a cornice composed of the veneer *H*, paper *I*, and veneer *G*, the grains of the veneers being arranged in opposite directions, and cemented to the paper, and the whole molded or formed in a heated matrix, substantially as and for the purpose specified.

SIMON O. BROCK.

Witnesses:

C. A. SHAW,
H. E. METCALF.

65-66

F. RICHARDSON.

MANUFACTURE OF PAPER CHAINS AND RINGS.

No. 176,481.

Patented April 25, 1876.

Fig. 1*Fig. 2.**Fig. 3**Witnesses:**Walter Belmont
J. F. Rush**Inventor:**Frederick Richardson*

UNITED STATES PATENT OFFICE.

FREDERICK RICHARDSON, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN THE MANUFACTURE OF PAPER CHAINS AND RINGS.

Specification forming part of Letters Patent No. 176,481, dated April 25, 1876; application filed August 5, 1875.

all whom it may concern :

Be it known that I, FREDERICK RICHARDSON, of the city and county of Providence, in the State of Rhode Island, have made certain new and useful Improvements in the Manufacture of Ornamental Chains and Rings; and I do hereby declare that the following specification is a full, clear, and exact description thereof.

My invention, while it may be used in the manufacture of various other articles, is more especially designed for ornamental chains, stringale-rings, and other like rings, and consists in making them from paper and subsequently finishing the same all in the manner substantially as described.

In my invention I make use of an arbor of suitable size and shape, upon which I wind strips of thin tough paper, previously saturated with glue, until the requisite bulk is attained.

The paper is then slipped off from the arbor while moist, and, after being cut into the desired lengths, is placed in a die of the shape

necessary to make the required link, ring, or other article, when it is pressed into a solid and hard mass, the die being so constructed that it will leave no burr upon the work.

In the case of a chain the alternate links are sawed open and afterward glued together.

After the chain or ring is completed it may be japanned or enameled in any desired color, or in imitation of shell, and thus finished up so as to present a neat and pretty appearance.

Chains and rings made from paper in this manner are not only stout but remarkably light in weight.

What I claim as my invention, and desire to secure by Letters Patent, is—

The herein-described method of making paper chain-links and rings by winding strips saturated with glue on an arbor, and then subjecting the material to pressure in a die, substantially as set forth.

FREDERICK RICHARDSON.

Witnesses:

WALTER B. VINCENT,
J. T. RICH.

McC. YOUNG.
Art of and Machinery for Making Paper Tubes.
No. 229,296. Patented June 29, 1880.

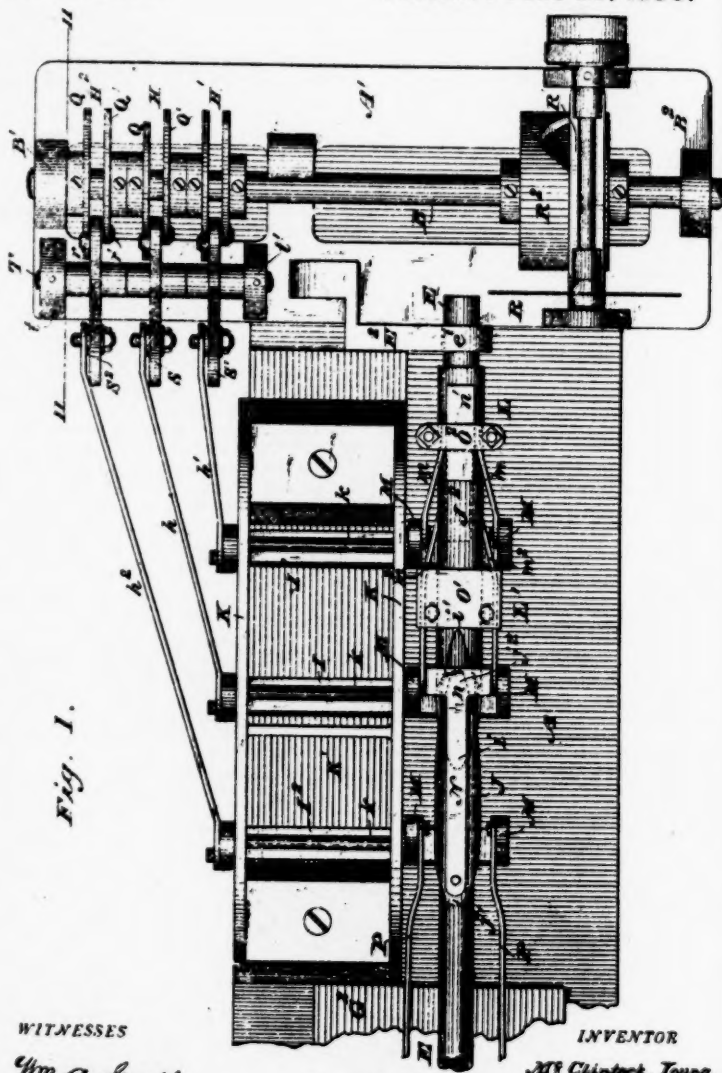


Fig. 1.

WITNESSES

Wm A. Shively.
Geo W. Buck

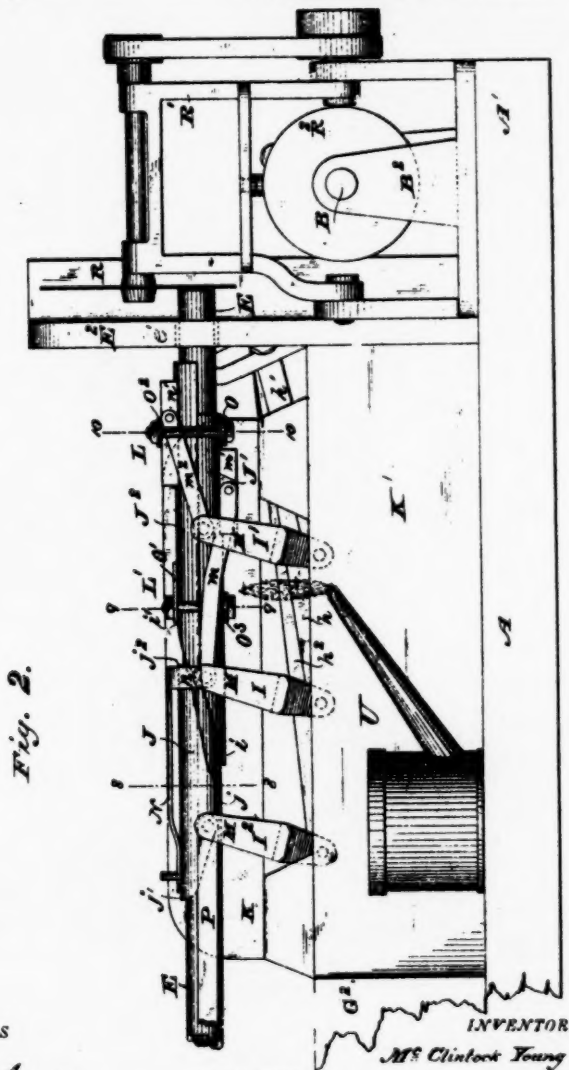
INVENTOR

By his Attorneys

*Mc Clintock Young.**Galdwin, Hopkins & Taylor.*

McC. YOUNG.

Art of and Machinery for Making Paper Tubes.
No. 229,296. Patented June 29, 1880.



WITNESSES

Wm A. Skindly.
Geo W Buck

By his Attorneys

By his Attorneys
Baldwin, Hopkins & Taylor

INVENTOR

Mr. Clinton Young

MoC. YOUNG.

Art of and Machinery for Making Paper Tubes.
No. 229,296.

Patented June 29, 1880.

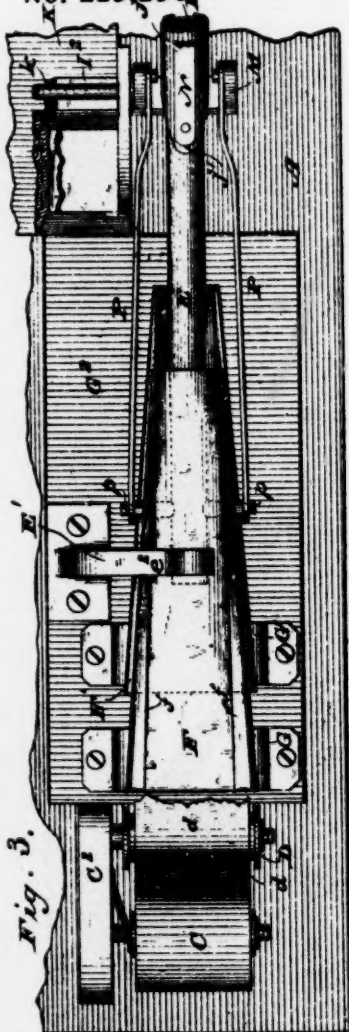


Fig. 3.

WITNESSES

Wm A. Smith.
Geo H. Buck.

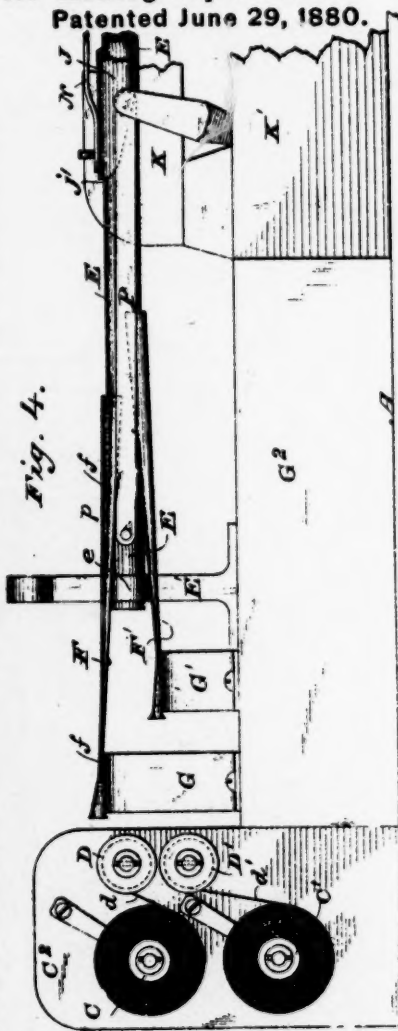


Fig. 4.

INVENTOR

Mc Clintock Young.

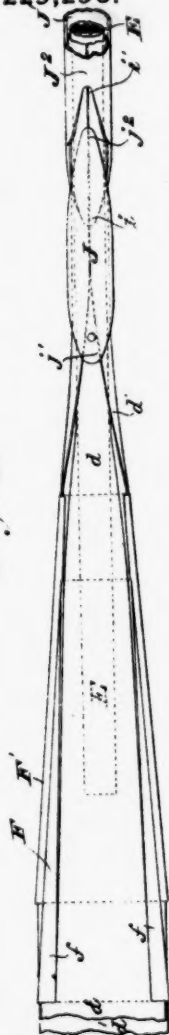
By Atty.

Galbraith, Hephner & Taylor.

McC. YOUNG.

Art of and Machinery for Making Paper Tubes.
No. 229,296. Patented June 29, 1880.

Fig. 5.



WITNESSES

Wm. A. Smith.
Geo. W. Buck

Fig. 6.

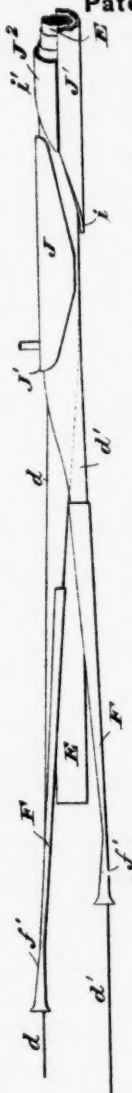
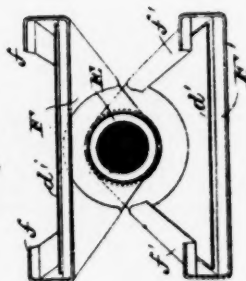
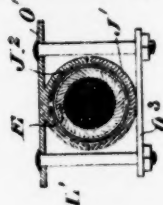
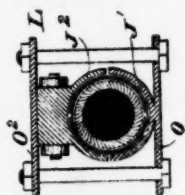


Fig. 10.

Fig. 9.

Fig. 8.

Fig. 7.



INVENTOR

M^c Clintock Young

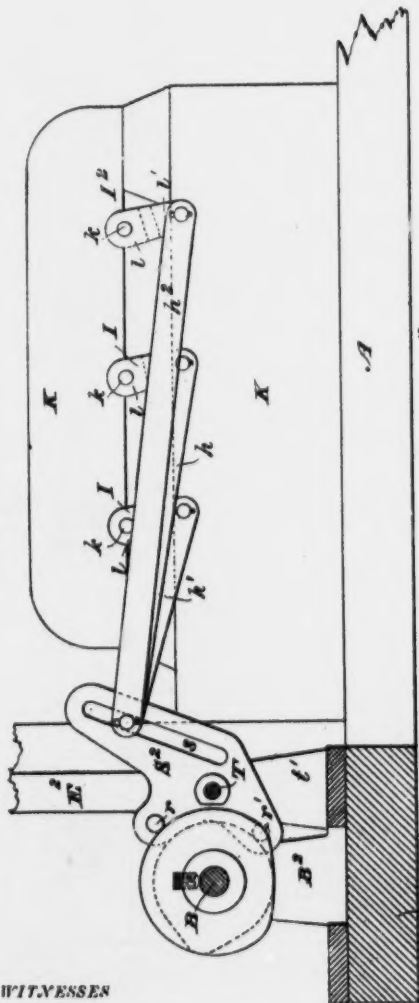
By his Attorneys

Galdwin, Hopkins & Taylor

McC. YOUNG.

Art of and Machinery for Making Paper Tubes.
No. 229,296. Patented June 29, 1880.

Fig. 11.



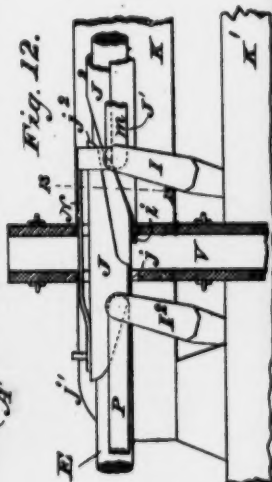
WITNESSES

Wm A. Smith,
Geo H. Buck.

Fig. 13



Fig. 12.



INVENTOR

McC. Young.

By his Attorneys

Goldwin, Hopkins & Hyatt.

UNITED STATES PATENT OFFICE.

MCCLINTOCK YOUNG, OF FREDERICK, MARYLAND.

ART OF AND MACHINERY FOR MAKING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 229,003, dated June 29, 1880.

Application filed September 12, 1879.

To all whom it may concern:

Be it known that I, MCCLINTOCK YOUNG, of Frederick, in the county of Frederick and State of Maryland, have invented certain new and useful Improvements in the Art of Manufacturing Tubes, Boxes, Bags, &c., of Paper and other Material, and in apparatus therefor, of which the following is a specification.

The object of my invention mainly is to dispense with a liquid or semi-liquid cementing substance in the automatic formation of tubes, bags, and boxes of paper, &c., and, while rendering unnecessary the employment of paste-applying mechanism with or as part of the machinery, to insure the proper contact and adhesion of the cemented seams, paste-attached joints, &c., of the articles being made.

Further, my object is to manufacture a double, closely-jointed, and longitudinally-seamed tube from two strips or webs of paper, which are respectively formed into the inner portion or lining and the outer portion or casing of the tube and securely united with each other at their contiguous surfaces by the connected and repeated operations of automatically-acting mechanism, which completes the tube, step by step, in short lengths, at regular intervals.

Heretofore, in the automatic formation of bags, boxes, tubular blanks, &c., it has been customary to provide paste-reservoirs and co-operating devices with or upon the machinery, so as to suitably apply the liquid cementing substance to the strips just previous to tubing, and to the bag-bottoms, lapping and pasted parts of boxes, &c., on the way to be cemented together. In such machinery, however, there is constant danger of applying the paste improperly, so as to cause injurious adhesion of parts and clog the machinery. Moreover, the pasting mechanism itself is more or less liable to derangement. To overcome these objections I provide previously gummed or cemented strips of material with the cement partially set or sufficiently dry to avoid clogging of the mechanism and injurious adhesive contact of the material, and cause these strips or parts of the material of which they are composed to adhere at the proper stage of the operation by the application of heat or moisture, or both.

My improvements in the art are hereinafter specifically designated by the claims.

I am aware that prior to my improvements

double tubes have been made both of paper alone and of a paper strip and a cloth or linen strip, or of combined paper and cloth, and so far as relates to the apparatus this invention is therefore confined to certain improvements applicable to the manufacture of double tubes wholly or in part only of paper, my improvements consisting in a novel organization of mechanism, and in combinations of devices which are hereinafter first described, and then specifically designated by the claims.

In the accompanying drawings I have shown all my improvements as embodied, in the best way now known to me, in a single machine, which in part somewhat resembles that known and described in Letters Patent of the United States No. 196,853, granted me November 6, 1877. Obviously, however, some of the parts may be used without the others, and in machines differing somewhat from the one represented and hereinafter specifically described, and the details of construction of portions of the mechanism for carrying out my improvements may be varied in some respects without departing from the spirit of my invention, some of which variations would be readily suggested to skillful mechanics or those skilled in the art to which my invention pertains simply by reading this specification and examining the drawings, in which—

Figure 1 is a plan or top view of a portion of the machine, representing the tube-finishing part and delivery end thereof, the driving shaft, and its connections; Fig. 2, a side elevation of the same parts. Fig. 3 is a plan or top view of that portion of the machine mostly omitted from the preceding figures, representing the paper-supplying and preparatory forming and folding part of the machine; Fig. 4, a side elevation of the same parts. Fig. 5 is a plan or top view of the formers or folders, the tube-finishing formers or supporters, and feeder-clamps, with their actuating mechanism omitted, and the mandrel about which the completed tube is clamped and along which it traverses; Fig. 6, a side elevation of the same parts. Fig. 7 is an end view or front elevation of the primary formers or folders to which the sheets first pass from the supply-rolls. Fig. 8 is a vertical section on the line 8 8 of Fig. 2; Fig. 9, a similar section on the line 9 9 of Fig. 2; Fig. 10, a similar section on

the line 10 10 of Fig. 2. Fig. 11 is a side elevation of a portion of the rear end and back part of the machine, partly in section on the line 11 11 of Fig. 1, showing the driving-shaft, its cams, and the parts actuated thereby. Fig. 12 is a view of a portion of the machine, showing the tube upon the mandrel and representing, in section, a tube or channel for conveying steam to moisten the paste upon the paper; and Fig. 13 is a section on the line 13 13 of Fig. 12, these last two figures illustrating a modification of my invention.

The mechanism is mounted upon a strong bed or base-plate, shown as composed of a long narrow part, A, and a widened end part, A'. That end of the machine supported above the front end of the narrow part A, or most remote from the laterally-extended part of the base, will be called the "supply" end, and the opposite end, or that at the widened part A' of the base, will be termed the "delivery" end, for convenience of description.

A driving-shaft, B, is mounted at the delivery end of the machine in bearings in uprights B' B', and serves to impart motion to a series of cams, which, through their connections, operate a reciprocating mandrel and actuate all of the tube-forming devices, as will hereinafter be explained.

Rollers C C', each mounted at one end in its bearings in an upright, C', at the supply end of the machine, have webs or strips of paper or of paper and linen, &c., wound upon them. The paper is led from the rollers to the tubing devices over guide-rollers D D', which are mounted upon shafts, each supported at one end in the upright C', in which the overhanging shafts of the paper-carrying rollers are mounted. Tension-springs are provided for bearing upon the rolls of paper, to prevent too free unwinding, as usual.

Each of the webs or strips d d', in this instance wholly of paper, is prepared before winding it into rolls by coating one of its sides or entire surfaces with suitable glue or other cementing substance. Ordinary hoof-glue will answer well for this coating. The paper being thus prepared in long strips and in large quantities, is prevented from becoming too hard or dry by keeping it in a properly moist or warm condition, as by storing it in a damp place. When in proper condition it is rolled. The paper will keep in good condition in a cellar.

If the glue is allowed to harden or completely set, it is liable to crack, and the paper will consequently break, crease, or pucker unless suitably treated before using it.

By preparing the paper in this manner and manipulating it as will hereinafter be explained, I render unnecessary the use of pasting devices as a part of the machine and avoid a source of considerable annoyance, for in operating tubing and similar machines with paste-applying devices as ordinarily constructed there is danger of clogging and great liability of derangement of the pasting mechanism,

which is at once uncertain in operation, requiring close inspection and occasional interruption of the working of machines.

The previously-applied coating of glue is heated or moistened is often it during the final steps in the formation of the tube and cause the strips to adhere to each other, as hereinafter described.

In this way not only is the mechanism rendered more compact and less complicated than it would be were there employed pasting devices or water-reservoirs, &c., for wetting previously-applied paste during the preliminary steps of tubing, but all liability to gum the machinery, improperly unite the material, &c., is avoided.

The strips d d' are wound, as shown, into rolls, with their glued surfaces inward, so that as drawn upward or from the under sides when placed on the rollers C C' the pasted surfaces will be uppermost, to leave a clean or unpasted inside and outside to the tube when completed, as will hereinafter be fully explained.

The tube is formed about a longitudinally-reciprocating intermittently-operating mandrel or final former, E, made of a round hollow bar or tube, supported so as to slide freely endwise to the desired extent in bearings e e' and e' near its opposite ends. The front bearing, e, is formed in an overhanging or inwardly-projecting arm, e', of an upright, E', near the supply end of the machine, and the rear bearing, e', is formed in a standard, E', near the main or driving shaft B.

The strips d d' of paper, as they are drawn to the mandrel, are acted upon by their respective primary formers or folders F F', which arch or curve and partially fold them preparatory to the completion of the double tube about the mandrel E. The strip d forms the inner portion or lining of the double tube, and the strip d' the outer portion, cover, or casing thereof. The primary former F decreases the edges of the strip d and bulges out its central part, the strip being thus transversely curved or arched upwardly to conform to the shape of the former. The inwardly-projecting longitudinal lips or flanges f f, turned up at the edges of the former, act upon the strip's edges and hold them in place, while the under surface or unpasted side of the strip bears upon the transversely-curved body or main part of the former extending between its edge lips. At the front or receiving end of the former it is of the full width or slightly more than the width of the strip and is plane-surfaced; or it may be curved slightly downward at its central or body portion between its lips, so as to receive the strip in its flattened form. The former is then gradually curved or bulged upward in an arch form between its lips, and is also gradually narrowed from front to rear to give the preparatory arched shape to the strip on the way to the mandrel E. The lips f f are most prominent at the front or receiving end of the former, being flared, as shown, to facilitate the adjustment of the strip in starting and prevent

under strain and friction on the paper. The top former, F, slightly declines toward its rear end.

The bottom former, F', for the outer or casing strip, d', taken from the under roller, U', is similar to the top former, F, in all essential respects, except that it is slightly wider than the top former and terminates beyond or extends a short distance farther toward the delivery end of the machine than the top former does, while the top former extends at front a short distance beyond the front end of the lower former, or in advance of it, and nearer the paper-supplying rollers, and the bottom former is transversely curved or arched downwardly from its upturned edges or flanges f' f', instead of being arched upwardly, as the top former. The two strips, as drawn along, are thus caused to approach each other at their edges and spread apart gradually. The width of the lower strip is sufficiently greater than that of the upper strip to enable the casing to envelop and completely cover the lining when the opposite edges of the respective strips are brought close together or abutted to form the tube.

The former F is supported at front upon a centrally-open frame or bracket, G, and a similar bracket, G', supports the former F' at its front end. The strip d' passes through the bracket G, or between its sides or uprights, beneath the former F, on its way to the former F', which inclines slightly from front to rear. The formers thus converging from front to rear terminate near the mandrel, the one, F, above and extending partially around the top surface of the mandrel, but not touching it, and the other, F', below, at a little from and also partially around the mandrel. Each former, at its rear end, about half-way surrounds the mandrel. The formers are supported at their front ends only upon the brackets G G', which are mounted upon the frame-bed in any suitable way. In this instance the brackets are bolted to a block or table, Q', upon which the standard E' for the front bearing of the mandrel is also mounted.

After passing beyond the rear ends of the formers F F' the strips are formed into a double tube about the mandrel E, with the top strip inside and the pasted surfaces of the strips together, and the tube is fed along by mechanism, soon to be described, operated from cams H H' H' on the main or driving shaft B. These cams are fast on the driving-shaft B and revolve with it when the machine is set in motion, the shaft being driven by hand or by any suitable power, as desired.

Vibrating frames I I' I' are actuated by the cams, with which they are connected by rods or pitmen A A' A'. These frames serve to operate a series of reciprocating intermittently-acting finishing-formers and tube-supporters, J J' J', which act also as feeders in connection with the reciprocating mandrel, around or partially around which they are curved outside of the tube, so as to inclose the tube be-

tween them and the mandrel. These final formers reciprocate rectilinearly instead of partially rotating or having the combined endwise and turning motion of the mandrel in my before-referred-to patent, No. 196,853, and are made of metal plates or sheet metal curved to the form shown; or they may be made by cutting a tube to the shapes desired. As represented, the former J, actuated from the cam H, is the first of the series, and acts mainly upon the top of the tube. It is cut away or tapered in both directions from a point near about midway its length and at its under side, and terminates at its ends in rounded points. In this way the former J is made to surround, or nearly surround, the tube for a slight distance at j, and the bearing-surface is then gradually diminished to the ends j' j', which bear upon the top of the tube. The rear former, J', is of a semicircular or half-tube shape for the greater portion of its length, and acts upon the under side or lowermost half of the paper tube. At its front end this former is cut away at its edges or tapered to a rounded point, i, beneath the correspondingly-shaped rear end, j', of the front former. The remaining finishing-former, J', acts upon the top of the tube and upon that part of it acted upon at bottom by the former J'. This former J' is of semicircular or half-tube shape, except at its front end, i', where it is notched or forked to accommodate the rear end of the former J. The three formers J J' J', it will be seen, are caused by their united action to bear on every part of the exterior of the tube, and thus insure a proper shape and complete finish of the tube as it is fed between them and the mandrel.

The vibrating frames I I' I', through or by way of which the endwise reciprocations are imparted to the formers J J' J' and to the mandrel E, are all alike. Each frame is pivoted by a rod, k, in a supplementary frame or metallic bracket, K, supported at the side of the mandrel on a table or block, K', fastened to the frame-bed A. The pivot-rods pass through bearings in lugs in the under side of the bracket at each side. The pivots pass through the upper parts, l, of double cranks or cross-lugs l' l' on the frames at one end, while the lower parts or arms, p, of these cranks of the frames are pin-jointed to the pitmen A A' A', respectively. Each of the vibrating frames has at its end opposite that jointed to the pitman a pair of cranks or upwardly-projecting arms M M. These arms M M of the frame I are connected with the finishing-formers J and J', so as to reciprocate them as the frame vibrates. A connecting bar or link, N, having a yoke or forked rear end, n, straddling the mandrel, is pivoted to the arms M M of the frame I, and at its front end the link is fitted loosely on a pin projecting upwardly from the former J, the former J', also operated from the frame I, being linked to its arms M M by rods m m. The front ends of these link-rods m m are jointed to the vibrating frame by the

pivots which connect with the yoke of the link N, and the rear ends of these links m m are pivoted to the opposite sides or vertical edges of a block or plate, m', fastened to the under side of the former J'.

The crank arms or lugs M M of the vibrating frame I' are linked to a block, n', fastened upon top of the former J'. The link-rods m' m' are jointed at their opposite ends to the arms M and to the block n'. To keep the formers J' and J' in proper position to confine the tube about the mandrel E and admit of the differential or independent reciprocating movement of these formers, two yokes or sliding couplings, L L', are provided. The yoke L is fastened to the former J' and the yoke L' secured to the former J'. Each of these yokes is made up of a cross-plate, O or O', fastened to the under side of the former J' or to the top of the former J', and connected by bolts and nuts to the cross-plate O' or O, the cross-pieces O' sliding upon the block n' of the former J', and the cross-plate O' sliding beneath the former J', as will readily be understood from the drawings.

The vibrating frame I' actuates the mandrel E. The arms M M of the frame are connected by long links P P with a cross-pin, p, fastened to the mandrel near its front end and just in rear of its bearings e, between the primary formers F F'. Pivots connect the opposite ends of the links with the frame-cranks and the cross-rod of the mandrel.

Each of the cams H H' H' is double, or has two acting-surfaces, Q Q', and the cams are so formed as simultaneously to advance the mandrel E and all of the finishing-formers J J' the length of a box, blank, or section of tube to be severed, and by this advance movement of the mandrel and formers the finished tube, held between the formers and mandrel, is projecting sufficiently far through and beyond the mandrel-bearing e' to have cut from its end overlapping the mandrel end a box-blank on each successive forward movement or feed of the tube. A rapidly-revolving saw or sharp-edged disk, B, mounted in a swing-frame, B', operated by a cam, R', on the main shaft B, serves to sever the blanks from the tube at regular intervals.

The operation is as follows: The strips are first adjusted properly to carry on the manufacture of the tube automatically, and the machine is then started, say, with the cams in the position they occupy after having acted upon the pins or rollers r r' of the respective oscillating arms S S' S', to simultaneously advance the mandrel and the formers J J' and project the tube beyond the mandrel. The next operation will be to simultaneously retract the formers J J' by the action of the cam H on the central arm, S. The arms S S' S', it should be observed, are all mounted to swing or vibrate independently on the short shaft T parallel with the driving-shaft, and mounted in frame-uprights t t'. The pitmen A A' A' are adjustably secured in slots e

in the arms S S' S', with which they are respectively connected. This adjustment admits of variation in the feed, and consequently in the length of the tube-sections or blanks cut off. At about the time the formers J J' are being retracted the cutter R severs a blank from the tube, cutting close to the projected end of the mandrel to shear the tube off smoothly. The cutter is retracted out of the way by its cam. The next action, as the driving-shaft continues to revolve, is to retract the former J' by the movements of the cam H', arm S', and vibrating frame I'. Next the mandrel is retracted by the action of the cam H' through the arm S', pitman A', frame I', and its connections with the mandrel. The cams next act together to feed the tube and draw the strips to the mandrel.

Detailed description of the construction of the cams is deemed unnecessary, as by the aid of the drawings and the knowledge of the work they are to do there would be no difficulty in producing them.

By first withdrawing the formers J J', then the former J', and finally the mandrel E, there is always sufficient stationary bearing-surface or frictional contact between an unmoving surface and the tube to prevent retrograde movement of the tube, while, when moved in the opposite direction for feeding, the simultaneous forward movement of the formers J J' and the mandrel with the tube confined between them positively feeds the tube and strips of paper.

I have described the use of previously-treated strips to avoid the necessity of employing pasting devices as part of the machine, and I deem the employment of such coated strip decidedly preferable. It is obvious, however, that paste might readily be applied to the strips as drawn to the mandrel when prepared material is not at hand.

To soften the glue coating on the strips heat is applied to the tube by a lamp, U, (see Fig. 2), the flame of which impinges against the former J', and the heat is conducted to the former J' by the metallic yoke-coupling L, to warm the tube all around and soften the glue.

The heat-radiating surface may be increased by suitable plates and deflectors in well-known ways, so as to insure perfect work.

The glue is thus softened, and becomes adhesive only at the time its function is to be performed, so as to cause the two papers firmly to adhere to each other when the glue sets or dries.

Instead of a lamp, a steam channel or tube, V, (see Figs. 12 and 13,) may be employed to conduct steam from any suitable source to the tube.

The steam-channel is made in sections to admit of its being adjusted and removed, as will readily be understood from an inspection of the drawings. Both heat and moisture are in this way applied.

I claim as of my own invention—

1. As an improvement in the art of auto-

10 matically forming tubes, &c., from strips of paper or equivalent thin material, the hereinbefore-described method, consisting in applying the strip or strips having the previously-applied coating of cementing material sufficiently dry to prevent sticking and clogging, and folding or partially forming while in this condition, and then softening the coating to cause the proper adhesion of the parts, substantially as hereinbefore set forth.

2. As an improvement in the art of automatically forming tubes, &c., the hereinbefore-described method, consisting in coating the strip or strips with a cementing substance, drying or partially drying the coating, feeding the strip or strips, folding or tubing, next softening the coating of cement, and finally pressing the united parts, substantially as hereinbefore set forth.

3. The combination, substantially as hereinbefore set forth, of the intermittently-reciprocating mandrel and the series of intermittently-acting reciprocating finishing-formers advanced with the mandrel to feed the tube and retracted at intervals, for the purpose set forth.

4. The combination, substantially as hereinbefore set forth, of the primary formers or folders, one above the other, and the mandrel terminating at its front end between said formers, to which mandrel the folded or partially-formed tube passes from the formers to be completed.

5. The combination of the primary formers or folders, to which the strips are first presented, the reciprocating mandrel supported at its front end between said folders, and the series of reciprocating finishing-formers, between which and the mandrel the tube is completed and fed step by step, these members being and operating substantially as hereinbefore set forth.

6. The combination of the reciprocating mandrel, its end bearings, the vibrating frame, the link-connections between said frame and the mandrel, and the pitman for actuating said frame, operated by the cam on the driving-shaft, substantially as and for the purpose hereinbefore set forth.

7. The combination of the driving-shaft, the cams H H' H'', the vibrating frames I I' P, operated by connections with the cams, the reciprocating mandrel, the finishing-formers, and the connections between said formers and mandrel with their respective vibrating frames, to cause the mandrel and formers to advance together and retract at intervals, substantially as and for the purpose set forth.

In testimony whereof I have hereto subscribed my name.

McCLINTOCK YOUNG.

Witnesses:

O. M. GILPIN,
O. P. FIRESTON.

54

79-80
(Model.)

T. P. TAYLOR.
MANUFACTURE OF BASE BALLS.

No. 262,257.

Patented Aug. 8, 1882.

Fig. 1.



Fig. 2.

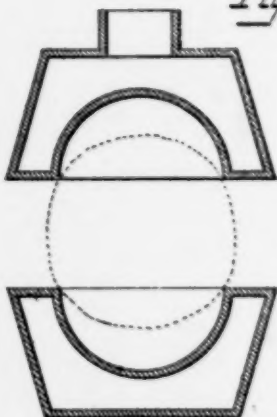
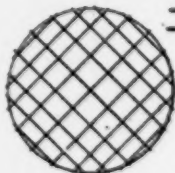


Fig. 3.



Attest:
Charles E. Taylor
Notary Public

Inventor
T. P. Taylor
By Charles E. Taylor
Attorney

UNITED STATES PATENT OFFICE.

THOMAS P. TAYLOR, OF BRIDGEPORT, CONNECTICUT.

MANUFACTURE OF BASE-BALLS.

SPECIFICATION forming part of Letters Patent No. 923,257, dated August 8, 1892.

Application filed July 8, 1892. (Model.)

To all whom it may concern:

Be it known that I, THOMAS P. TAYLOR, a citizen of the United States, and a resident of Bridgeport, Fairfield county, Connecticut, have invented certain new and useful Improvements in the Manufacture of Base-Balls, of which the following is a specification.

My invention relates to the manufacture of playing-balls; and it consists in making the same of the material and in the manner fully described hereinafter, so as to secure sufficient elasticity with reduced expense and greater durability than balls made in the ordinary manner.

The ball consists of istle or tampico fiber formed into a compact spherical mass and suitably covered, and may be effectively made by wrapping or bundling together the said fibers, and then condensing the same by means of semi-spherical heated dies, which both compress and temper the mass, forming a compact, solid, yet elastic filling, upon which the cover is subsequently supplied in any suitable manner.

In the drawings, Figure 1 represents the mass of istle fibers formed by winding a cord made of such fibers upon itself or by collecting the fibers together under a light pressure or otherwise. Fig. 2 represents hollow dies heated by steam or otherwise to a temperature less than that which would scorch the fiber, and adapted to receive between them a mass of fiber, Fig. 1, and to condense and shape the same

and simultaneously temper the fiber; and Fig. 3 represents the compacted mass after it has left the dies with a surrounding netting of cord, whereby the fibers are held together in their spherical condition.

If desired, any suitable cement—for instance, rubber cement or celluloid—may be applied to the fibers, so that the sphere will retain its shape after leaving the dies.

I have found that a ball constructed as above described is much cheaper than one having the usual rubber filling, and is harder, while sufficiently elastic, and that it is more elastic and durable than one made of compacted yarn.

I claim—

1. A ball having a filling of istle fibers as set forth.

2. A ball provided with a filling composed of tempered and compacted istle fibers, as set forth.

3. The mode of making balls, as described, consisting in collecting a mass of istle fibers, condensing and molding the same by heated dies to form a spherical filling, and then covering the latter, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOS. P. TAYLOR.

Witnesses:

HERMAN GAUSE,
EDWARD L. WHITE.

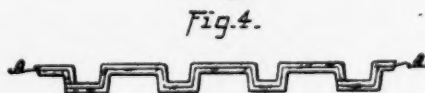
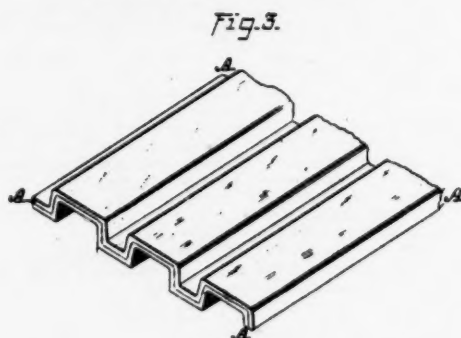
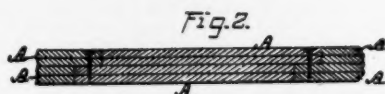
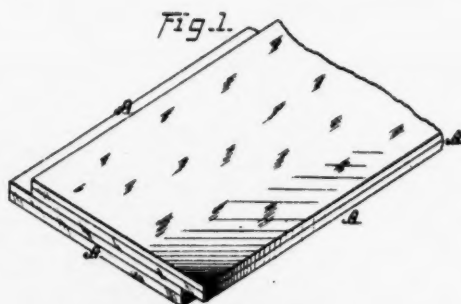
56
83-84

(Model.)

S. H. HAMILTON.
MANUFACTURE OF PAPER BOARD.

No. 269,816.

Patented Dec. 26, 1882.



WITNESSES:

James Hutchison
Henry C. Hager

INVENTOR.

S. H. Hamilton, by
Rindell & Co. his Attys

UNITED STATES PATENT OFFICE.

85-86

WILLIAM H. HAMILTON, OF BUSHNELL, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO MARVIN A. FARR, OF CHICAGO, ILLINOIS.

MANUFACTURE OF PAPER-BOARD.

SPECIFICATION forming part of Letters Patent No. 200,816, dated December 26, 1882.

Application filed August 12, 1878. Renewed October 24, 1881. (Model.)

Be it known that I, SILAS H. HAMILTON, of

Bushnell, in the county of McDonough, and in the State of Illinois, have invented certain new and useful improvements in the Manufacture of Flooring, Weather-Boarding, &c., from Paper; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of one end of a strip of my improved flooring or plain weather-boarding. Fig. 2 is an end elevation of the same as connected with other strips of like construction. Fig. 3 is a perspective view of a sheet of drop weather-boarding constructed by my improved method, and Fig. 4 is an end elevation of the same.

Letters of like name and kind refer to like parts in each of the figures.

The design of my invention is to lessen the cost and to increase the durability of buildings by rendering practicable the employment of paper as a substitute for wood for uses as flooring, sheathing, weather-boarding, &c.; and to this end it consists, as a new article of manufacture, in a sheet of weather-board composed of separately-formed sheets or layers of paper secured together by an adhesive mixture and pressure, and corrugated transversely, so as to cause its surface to present the appearance of several strips of ordinary weather-board, substantially as and for the purpose hereinafter shown.

The nature of my invention is shown equally in each of the articles hereinafter described. In the annexed drawings, A and A represent sheets of paper-board, which are formed of any suitable material, and are made dense by subjecting each to a heavy pressure. Two or more of the sheets A are now coated upon their sides with an adhesive preparation, preferably composed of forty-nine parts of glue and one and one-eighth part of bichromate of potash dissolved in water, are placed in contact, and are then subjected to heavy pressure between two rollers, by which means said sheets are caused to adhere together and to become practically homogeneous.

For flooring and ceiling the edges of the

sheets A are offset, as seen in Figs. 1 and 2, so as to form rabbets at such points, by which means opportunity is afforded for securing together the rabbeted edges of two or more strips, as shown in Fig. 2.

For ordinary overlapping weather-boarding the rabbets may, if desired, be omitted, while for drop weather-boarding (as seen in Figs. 3 and 4) a board is employed that has a width equal to that of several ordinary weather-boards, which said board is passed longitudinally through rollers that give to it the form shown in Figs. 3 and 4, each board being thus caused to present the appearance of two or more drop weather-boards.

The edges of the drop weather-boards may be left plain and caused to overlap, or they may be rabbeted in the manner before described.

The articles thus described possess all the rigidity, durability, and ability to resist abrasive wear that is found in any of the soft woods, while they are not subject to the changes which are occasioned by atmospheric influences upon wood.

I am aware that it is not new to corrugate roofing-boards composed of an outer sheet of metal and an inner sheet of paper. The article thus produced is not affected by changes of temperature or by moisture, and when worked up into doors, sash, or other like articles is less liable to change than any material heretofore employed.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

As a new article of manufacture, a sheet of weather-board composed of separately-formed sheets or layers of paper secured together by an adhesive mixture and pressure, and corrugated transversely, so as to cause its surface to present the appearance of several strips of ordinary weather-board, substantially as and for the purpose shown.

In testimony that I claim the foregoing I have hereunto set my hand this 12th day of August, 1878.

SILAS H. HAMILTON.

Witnesses:

GEO. S. PRINDLE,
JAS. E. HUTCHINSON.

UNITED STATES PATENT OFFICE.

SIEGISMUND LOEWENTHAL, OF ACTON, COUNTY OF MIDDLESEX, ENGLAND.

MANUFACTURE OF ORNAMENTAL WALL-COVERING, LEATHER-CLOTH, &c.

SPECIFICATION forming part of Letters Patent No. 327,286, dated September 29, 1885.

Application filed July 4, 1885. (No specification.) Forfeited in England January 1886, No. 2,000.

To all whom it may concern:

Be it known that I, SIEGISMUND LOEWENTHAL, a subject of the Queen of Great Britain, residing at Acton, Middlesex, England, have invented new and useful Improvements in the Manufacture of Ornamental Wall-Coverings, Leather-Cloth, and the Like, and in compositions used therein, (for which I have obtained a patent in Great Britain, No. 9,025, bearing date June 14, 1884,) of which the following is a specification.

The object of this invention is to compound certain ingredients together to form a plastic adhesive body capable of being spread or rolled upon a canvas or other backing to any desired thickness, and which can be printed in plain or many colors, or metallized to produce ornamental or decorative effects, either plain or embossed, and with or without an exterior or surface sheet of canvas, according to the use the material so prepared is intended for.

The material is particularly adapted for wall decoration, imitation leather, floor-cloth, and other useful purposes. For this purpose I employ a composition of which African flake is the chief ingredient. I spread this composition upon a fabric, paper, or card-board, and after a pattern is printed on its surface, by means of blocks, rollers, or any other known process, I cause the material to be embossed by means of a die and pressure or rollers on the surface of which a design is engraved. The material is after this hung in a heated room for a considerable period in order to get dry.

The compound is composed of one hundred pounds of African flake, ten pounds of rubber, one hundred pounds of rubber substitute, ten pounds of ozocerite, one hundred weight of infusoria, and one hundred weight of wood-pulp or ground cork. Add to this two and one half per cent. of sulphuric acid and five per cent. muriatic acid. All these materials in their various proportions I mix in a mixing-machine, and after amalgamating them thoroughly I spread the compound on fabric, paper, or card-board, by means of a calender, to a suitable thickness. In some cases I spread a very light fabric on the surface of the compound.

This can be printed in the same manner as wall-papers are generally printed, and when the colors are thoroughly dry I bring the whole under a press, on the top platen of which an engraved die is secured corresponding with the pattern printed on the surface of the material. I place the printed pattern directly under the die, and by means of the pressure caused by the press I emboss the printed pattern on the material. On floor-cloth I omit the latter process. On leather-cloth I emboss the material either with or without the printed pattern, which is also the case with wall decorations when desirable. After this process is completed I expose the material to a heat of from 80° to 180° Fahrenheit.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The hereinbefore-described process of ornamenting fabrics, consisting in applying to the surface thereof a compound composed of African flake, rubber, rubber substitute, ozocerite, infusoria, wood-pulp or ground cork, and sulphuric and muriatic acids in about the proportions specified, then printing upon the same patterns or designs, and finally drying the printed fabrics, substantially as set forth.

2. The process hereinbefore described of ornamenting fabrics, consisting in applying to the surface thereof a compound composed of African flake, rubber, rubber substitute, ozocerite, infusoria, wood-pulp or ground cork, and sulphuric and muriatic acids in about the proportions specified, then printing patterns or designs thereon, then embossing the same by means of dies or rolls having thereon designs or patterns corresponding with the printed designs or patterns, and finally drying the fabric, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

SIEGISMUND LOEWENTHAL.

Witnesses:

RICHARD CORE GARDNER,

O. A. GROSSETETE,

Both of 166 Fleet Street, London, E. C.

UNITED STATES PATENT OFFICE.

ROBERT F. NENNINGER, OF NEWARK, NEW JERSEY.

COMPOSITION FOR FLOOR AND WALL COVERINGS, &c.

SPECIFICATION forming part of Letters Patent No. 342,377, dated May 25, 1886.

Application filed October 13, 1865. Serial No. 179,785. (No specimens.)

To all whom it may concern:

Be it known that I, ROBERT F. NENNINGER, of Newark, Essex county, New Jersey, have invented a new and useful Improvement in Compositions for Floor and Wall Coverings, &c., of which the following is a specification.

My invention relates to a new and useful composition of matter which is adapted to a great variety of purposes—such as for floor and wall coverings, roof-coverings, as a substitute for leather, oork, or rubber, and building-sheathing—the said composition being an elastic flexible water-proof body, which may be pressed into desired form.

My composition consists of any fiber, preferably short, such as linen, cotton, hemp, or jute—as, for example, as prepared in pulp for paper-making—any material, such as hair or fur, from which felt is ordinarily made, mineral wool, the short lint from cotton-gins, and so on through a great variety of like substances, animal, vegetable, and mineral. With said fiber I combine any suitable water-proof resinous or gummy substance which can be dissolved in a volatile fluid—such as a light hydrocarbon—which hydrocarbon I subsequently cause to evaporate and so to be expelled from the mass. The fiber is then agglutinated by the gummy substance, and on drying there is produced a strong elastic flexi-

ble body, which may be pressed, if desired, into any suitable form.

As one embodiment of my invention, I may use as fiber paper-pulp in a dry state, and, as the permeating liquid, the gummy or resinous residue produced by heating linseed-oil to a high temperature, this residue being dissolved in a suitable hydrocarbon, which hydrocarbon is subsequently expelled from the mass by volatilization. The resulting body may be pressed into shape—as, for example, by passage between rollers—to form a flexible sheet.

In another application for Letters Patent filed simultaneously herewith, serially numbered 179,796, I have claimed the process of manufacturing the aforesaid composition as herein set forth. Said process is herein disclaimed.

I claim as my invention—

The composition of matter herein set forth, consisting of paper-pulp in a dry state, and the gummy viscous residue derived from heating linseed-oil, the same being intimately mingled and agglutinated into an elastic flexible mass, substantially as described.

ROBERT F. NENNINGER.

Witnesses:

PHILIP J. O'REILLY,
JOHN BRICE.

CU
91-92

(No Model.)

C. W. SPURR.

VENEERING.

No. 348,593.

Patented Sept. 7, 1886.

Fig. 1.



Fig. 2.



Fig. 3.



Witnesses

L. H. Piper

W. B. Toney

Inventor

Charles W. Spurr

by R. H. Toney atty.

UNITED STATES PATENT OFFICE.

CHARLES WATERMAN SPURR, OF BOSTON, MASSACHUSETTS.

VENEERING.

SPECIFICATION forming part of Letters Patent No. 348,592, dated September 7, 1886.

Application filed February 11, 1886. Serial No. 191,823. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WATERMAN SPURR, of Boston, in the county of Suffolk, and Commonwealth of Massachusetts, have
 5 invented a new and useful Improvement in Veneering; and I do hereby declare the same to be described in the following specification, and represented in the accompanying drawings, in which—

10 Figures 1, 2, and 3 indicate transverse sections of veneering made in accordance with my invention, the nature of which is defined in the claims hereinafter presented. Fig. 1 exhibits the veneer as plain, or not molded
 15 or embossed, while in Fig. 2 it is shown as molded or embossed. Fig. 3 represents it as molded and having the interstices of its backing filled, as hereinafter described.

The said veneering is composed of sheets
 20 or veneers of the wood veneer laid in pack and united by vulcanized rubber, in very thin sheets, extending between them, there being
 25 fixed to one of the outermost veneers, by vulcanized rubber or rubber cement, a backing of card-board, cloth, or other suitable material.

In the said drawings, *a* and *c* denote two thin wood veneers, *b*, the vulcanized rubber connecting them, while *e* is the backing, and *d*
 30 the vulcanized rubber joining such backing to the veneer *c*.

I do not confine my invention to two wood veneers only, as three or more may be used in pack and connected by vulcanized rubber
 35 arranged between their next adjacent surfaces and upon the surface to which the backing is fixed by such rubber.

In manufacturing the veneering or combination described, I first use between the surfaces to be connected a vulcanizable rubber
 40 or cement, and after having spread it on such surfaces, or properly applied it thereto, and laid the whole together in pack, I expose the pack to heat, or a temperature such as will
 45 vulcanize the rubber or cement. The grain of one veneer I generally extend across that of the next one to it, in order to strengthen them, so as to prevent them from cracking under the high temperature to which they

may be subjected in the vulcanizing process. 50
 Prior to subjecting the pack to such process, I generally press it in a suitable mold or molds or between dies to impart to it any desirable ornamental appearance, in some cases causing it to be more or less convex on
 55 the outer face and correspondingly concave on the inner face of the pack. The said pack having thus been molded, embossed, or ornamented is to be heated to the proper temperature for vulcanizing the rubber or rubber
 60 cement. The article or new manufacture thus produced will not only be very pliable, but water-proof, so that it can be fixed by glue or cement to a surface to be veneered without danger of the glue, or moisture, there-
 65 from striking through the veneers and staining or otherwise injuring the outer surface of the outermost one.

In some cases I fill the interstices in the backing, as shown at *f* in Fig. 3, with some
 70 suitable material, as filaments of cotton—for instance, glued or cemented together and to the backing in order to impart to it on its rear face a plain flat surface.

The veneering thus produced can be employed to great advantage in finishing and ornamenting walls or furniture.

I claim—

1. As a new or improved manufacture, veneering, substantially as described, consisting of thin veneers of wood arranged in pack and connected by vulcanized cement or india-rubber arranged between them, essentially as
 80 set forth.

2. Veneering consisting of thin veneers of wood and a backing of other material arranged in pack and connected by vulcanized cement or india-rubber extending between their next contiguous surfaces, as set forth.

3. Veneering, substantially as described, molded or embossed, as specified, and consisting of thin veneers of wood, or such, and a backing of the same or of other material arranged in pack and connected by vulcanized cement or india-rubber extending between their next contiguous surfaces, as set forth.

4. Veneering, substantially as described,
molded as specified, and consisting not only of
thin veneers of wood, or such, and a backing
arranged in pack and connected by vulcan-
5 ized cement or rubber extending between
their next contiguous surfaces, but of an
auxiliary backing or fillings, essentially as

described, inserted in the cavities or inter-
stices of the primary backing, essentially, as
explained.

CHARLES WATERMAN SPURR

Witnesses:

R. H. EDDY,

S. N. PIPER.

(No Model.)

3 Sheets—Sheet 1.

C. W. JEFFERSON.

ELECTRIC MOTOR AND DYNAMO MICA INSULATOR.

No. 491,708.

Patented Feb. 14, 1893.

Fig. 1.

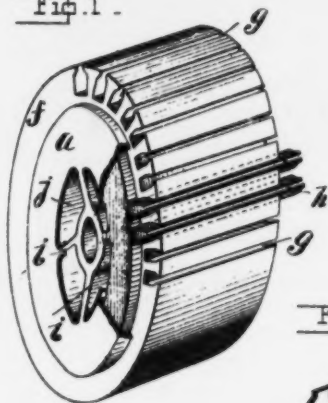


Fig. 2.

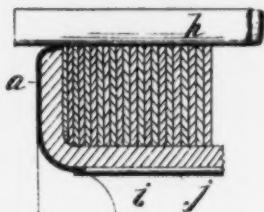


Fig. 3.

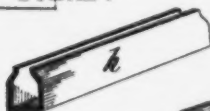


Fig. 6.

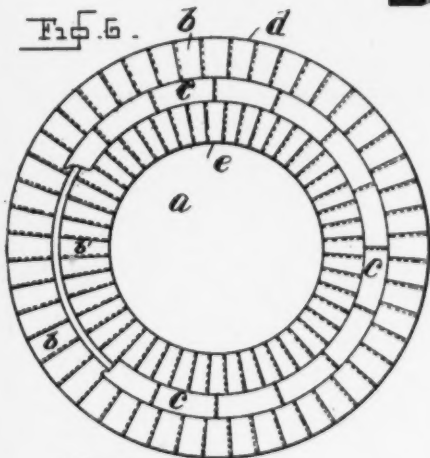


Fig. 4.



Fig. 5.



Witnesses

W. A. Conittland

Nellie L. Pope.

Inventor

Charles W. Jefferson.
By his Attorney,

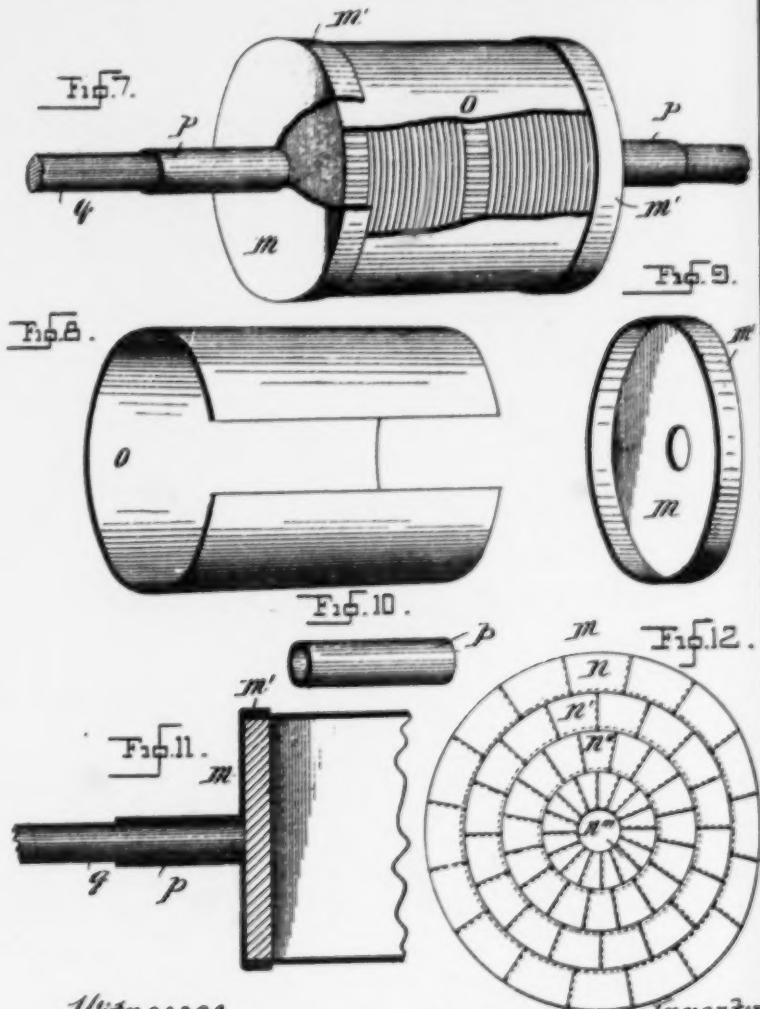
Edward P. Thompson

C. W. JEFFERSON.

ELECTRIC MOTOR AND DYNAMO MICA INSULATOR.

No. 491,708.

Patented Feb. 14, 1893.



Witnesses
 W. A. Courtland
 Nellie L. Pope.

Inventor
 Charles W. Jefferson
 By his Attorney
 Edward P. Thompson

(No Model.)

3 Sheets—Sheet 3.

C. W. JEFFERSON.

ELECTRIC MOTOR AND DYNAMO MICA INSULATOR.

No. 491,708.

Patented Feb. 14, 1893.

Fig. 13.

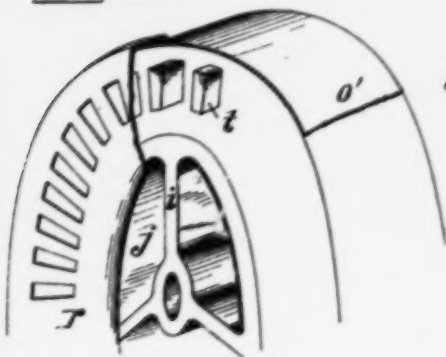


Fig. 14.

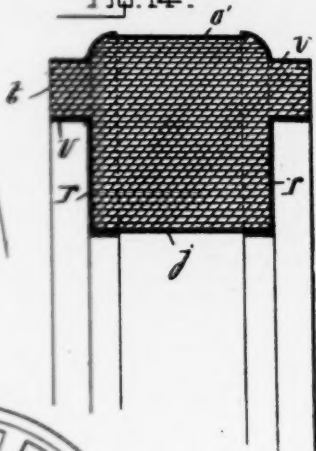


Fig. 15.

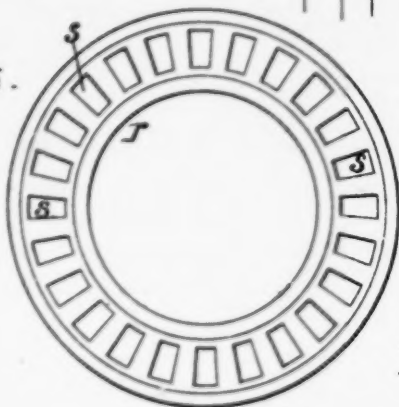


Fig. 16.



Fig. 17.



Witnesses

Wm. A. Courtland

Nellie L. Pope.

Inventor

Charles W. Jefferson,
By his Attorney

Edward P. Thompson

UNITED STATES PATENT OFFICE.

CHARLES W. JEFFERSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO
EUGENE MUNSELL & CO., OF NEW YORK, N. Y., AND ELIZABETH, NEW
JERSEY.

ELECTRIC MOTOR AND DYNAMO MICA INSULATOR.

SPECIFICATION forming part of Letters Patent No. 491,708, dated February 14, 1893.

Application filed June 1, 1892. Serial No. 435,171. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. JEFFERSON, a subject of the Queen of Great Britain, and a resident of Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Electric Motor and Dynamo Mica Insulators, (Case No. 3,) of which the following is a specification.

My invention relates to the end pieces or heads and other insulating wrappers for armatures, dynamos or electric motors.

The object of the invention is to thoroughly equip the armature with insulation which is practically entirely formed of mica, which is known to be among the very best electrical insulators.

In order that my invention may be understood as applied to any of the ordinary types, I have shown the same, in detail as regards the Gramme, the Siemens, and the Pacinotti, by means of the accompanying drawings.

Figure 1 is a perspective view of a Gramme or ring armature, provided with mica insulators in accordance with my invention. Some of the insulators are omitted and parts are broken away, and only some of the grooves are indicated in the drawings. Fig. 2 is a section of a portion of the armature shown in Fig. 1, indicating particularly the iron laminæ and pulley for holding the same. Fig. 3 is one of the insulators to be inserted in the grooves shown in Fig. 1, where to such insulators are applied. The insulator in Fig. 3 is shown in perspective. Fig. 4 is the mica insulator applicable to the interior of the ring. Fig. 5 is a perspective view of the flanged annular mica disk employed as a head piece to the ring armature. Fig. 6 shows in plan the mechanical construction of the head piece represented in Fig. 5. Fig. 7 is a perspective view of a drum armature with parts broken away for the purpose of showing that to which the mica insulators are applied. Fig. 8 is a perspective view of the cylindrical mica insulator shown partly also in Fig. 7. Fig. 9 is a perspective view of the mica insulating head. Fig. 10 is a similar view of the insulating tubing for the armature shaft. Fig. 11 is a sectional view showing the application of the elements

in Figs. 8, 9, 10. Fig. 12 is a plan of the head before it is flanged, showing the mechanical construction thereof. Fig. 13 is a perspective of a ring armature having end projections to form notches to hold the conductors. Only a part of the armature is shown. Fig. 14 is a section of a portion of the armature shown in Fig. 13. Fig. 15 is a plan of the mica head piece seen in Fig. 13. Fig. 16 is an insulator for the projections seen in Fig. 13. Fig. 17 is a plan of a portion of the iron ribbon forming the core shown in Fig. 14.

The head *a* has the following construction: Radial mica scales *b* are fastened together with overlapping edges to form a ring; a concentric ring is likewise formed of scales *b'*, the two rings not overlapping each other in the construction shown in Fig. 6.

c represents mica scales overlapping each other and forming a ring connecting the first two named rings which are lettered *d* and *a*. The scales *c* overlap the scales *b*, *b'*; several rings *a* are made in like manner and piled on top of each other, cemented with varnish, compressed; and before drying are molded by pressure into substantially the form shown in Figs. 1 and 5. During the process of bending in the mold, the radial and overlapping mica scales *b*, *b'* and *c* slide to accommodate the bending, so that, if the varnish is dried while in the mold, the ring *a* will take up a permanent set which will exhibit the form shown in Figs. 6 and 1. The slotted insulator in Fig. 3 is also constructed of laminæ made of artificial mica sheets, constructed in a manner similar to that named in reference to the ring shown in Fig. 6. It is of such a form as to slide into the dove-tailed grooves *g* in the armature *f*. The ends of the slotted insulators *h* shown in Fig. 3, project beyond the grooves *g*. Between the spokes *i*, are curved insulators *j* which are cylindrical with a given cylinder, except near the ends, which are abruptly bent inwardly against the spokes. The sheet of which the insulator *j* is constructed is built up of mica scales having cemented overlapping joints.

The head *m* shown in Figs. 7, 9, 11, and 13 consists of concentric overlapping rings made of overlapping mica scales *n*, *n'*, *n''*, *n'''*, &c.

mented together and piled on top of one another as to the concentric rings considered together as their disk. While the varnish is still wet the flange m' is turned up and thus held during the process of drying the varnish, after which the head remains as a flanged insulator. The split cylinder o is also built up of laminated mica sheets each consisting of scales of mica overlapping. The said cylinder is wrapped upon the drum armature as in Fig. 7. The head m is applied to the end of the armature in such a manner that the flange m' overlaps the end of the cylinder o . The mica insulating tube p is applied to the shaft q which it fits snugly.

The head r is an annular disk with its inner and outer edges flanged and provided with trapezoidal perforations s , through which pass iron projections t of the armature core, which is made of a ribbon u wound in convolutions and having wider portions u' to form the said projections t . In Fig. 17 the strip is magnified in length and diminished in width for the purpose of illustrating better that the strip u has an enlarged portion. Upon the trapezoidal projections t are slipped and held trapezoidal tubes v , so that when wire is wound in the usual manner, it will be held effectually away from the metallic part of the armature. On the interior of the armature are pieces of mica insulating sheets exactly like that shown in Fig. 4.

The trapezoidal tubes v , and the circular tube p may be held to the heads by shellac or varnish. Also varnish may be applied between the heads a , m and r and the insulating covering of armature shown in Fig. 13.

I claim as my invention:

1. An annular disk for insulating armature head, consisting of laminæ of annular disks each of which consists of the combination of concentric rings formed of mica, with their edges overlapping and cemented together and

a ring of mica scales overlapping and cemented to one another and to said first named rings.

2. A disk for insulating armature heads, consisting of concentric rings of mica scales, radiating from the center, overlapping and cemented together at their edges.

3. A disk for insulating armature heads, consisting of concentric rings of mica scales, radiating from the center, overlapping and cemented together at their edges, and a flange formed at the periphery of said disk.

4. An armature consisting of the combination of a ring core supported upon radial spokes, a flanged annular mica disk, applied to each end of said ring, the flanges passing to the interior and exterior of said ring, curved mica sheets applied to the interior of said ring, between the spokes, slotted mica insulators h , applied in grooves which are provided on the exterior of said armature, and projecting from said grooves at the ends.

5. An armature consisting of the combination of a ring core supported upon radial spokes, a flanged annular mica disk, applied to each end of said ring, the flanges passing to the interior and exterior of said ring, curved mica sheets applied to the interior of said ring, between the spokes, slotted mica insulators h , applied in grooves which are provided on the exterior of said armature and projecting from said grooves at the ends, each of the said mica insulators being formed of mica scales cemented together with overlapping edges cemented together.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two witnesses, this 28th day of May, 1892

CHARLES W. JEFFERSON.

Witnesses:

A. H. JACKSON,
S. W. JACKSON.

CS

(No Model.)

101-102

No. 508,653.

E. THOMSON.
INSULATING COMPOSITION.

Patented Nov. 14, 1893.

Fig. 1.

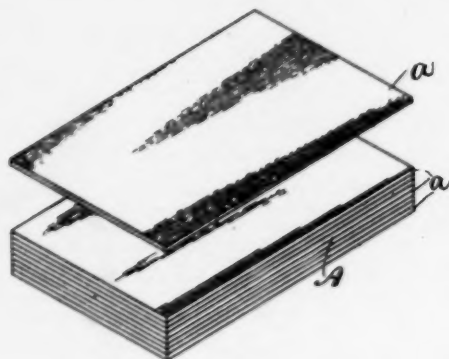


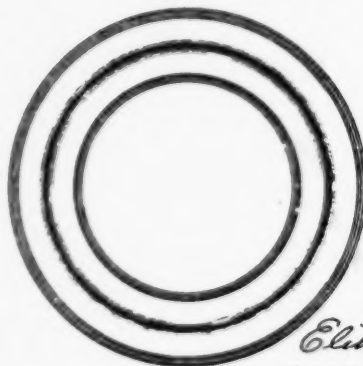
Fig. 2.



Fig. 3.



Fig. 4.



WITNESSES:
Wm. F. McDonald
Atty.

INVENTOR
Elihu Thomson
by B. M. Lloyd
Atty.

UNITED STATES PATENT OFFICE. 103

69

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

INSULATING COMPOSITION.

SPECIFICATION forming part of Letters Patent No. 508,653, dated November 14, 1893.

Application filed November 2, 1891. Serial No. 410,803. (No specimens.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, in the county of Essex and State of Massachusetts, have invented certain new and useful improvements in Insulating Compositions, of which the following is a specification.

My present invention relates to the production of slabs of insulating material such as are suitable for use in the construction of dynamo electric machines in place of mica where strength, together with some flexibility is required, and where the material must resist the formation of carbonized lines or carbonized paths through the same transversely to the sheet or slab.

In the accompanying drawings Figure 1 shows the manner of building up my insulating material from a number of paper sheets, treated or coated with non-carbonizable insulating material. Fig. 2 shows a cross section of the completed material. Figs. 3 and 4 show some of the numerous forms which may be given to the material.

For the purpose of my invention I take sheets *a* of comparatively thin paper, (such as ordinary letter paper, say .0025 inch to .005 inch in thickness, more or less,) and coat or impregnate the same with a deposit or a thin layer of mineral substance such as a mixture of fine kaolin or silicious compound or equivalent thereto and soluble silicate of soda. This may be done by applying a silicious solution to the paper. I pile these sheets as shown in Fig. 1, into a mass *A*, which gives a slab of the desired thickness. The silicious material will thus be incorporated more or less with the paper and may penetrate throughout the same or may be mostly on the surface, in the form of a coating or layer, which should, however, be as thin as practicable. The mass is then dried out so as to remove all moisture from it, and then forms thin slabs of insulating material which are adaptable to many purposes, the strength being conferred by the paper while the deposit or layers of silicious matter form insulating layers which prevent the formation of a carbonized line of particles across the same. Hence the compound may be used in commutator insulation between the segments or the like. The alternate ar-

range ment of the paper layers *a* and the silicious coatings *b* is indicated in Fig. 2. While the material simply dried in this manner is adapted for many purposes, I prefer to perfect the substance by baking it at a moderate red heat whereby the paper is more or less carbonized and the silicious matter more or less vitrified or fritted together into a thin, flexible slab with carbonized paper more or less incorporated therewith. In other cases I heat the slab in contact with air for a sufficient time to burn out the carbonaceous matter left by the paper. In this latter case however, the strength will not be as great. By baking as described, there is obtained a series of thin slabs of insulating material resembling baked porcelain, clay, or half formed glass which may be retained in the form of a slab or split up into layers, as desired.

I prefer to make the silicious deposit mainly as a coating or external layer, so as to give distinct silicious layers in the completed article. By burning out the paper completely it is even possible to separate the layers after baking so as to obtain thin flat sheets of what would resemble porcelain. In this case the invention is practiced as follows, the object being to produce a series of thin plates of porcelain biscuit or unglazed porcelain made at a comparatively low temperature. I take the paper sheets and place between them thin slabs of the clay or silicate mixture and pile them one above the other,—paper, clay mixture, paper, clay mixture, &c., to any desired thickness. I then thoroughly dry the mass as uniformly as possible so as to avoid warping. It is then baked at a moderately high temperature such as a bright red heat and if desired the heat continued until the paper being carbonized is burned out by the presence of oxygen. I then have a bundle of thin slabs which may be either used as such or by separating them one from the other, as desired, by splitting them apart. By shaping the coated paper into the proper form, the finished material may be made to take any form desired, for example that indicated in Figs. 3 and 4, and to consist of layer upon layer of the vitreous substance separated by what remains of the paper as carbonized material or as ash according to the degree of baking, although

my process, as stated before, does not necessarily involve the baking process if the material is not to be waterproof.

Instead of silicious compounds I may use
5 any other materials, of the requisite insulating and non-carbonaceous nature, such for example as earthy oxides or other metallic salts. It is preferred however to employ a
10 mixture of silicates, such as an earth silicate, giving a body, and an alkaline silicate which serves as a cementing material.

What I claim as new, and desire to secure by Letters Patent, is—

1. The process of making insulating material which consists in applying non-carbonaceous material to sheets of paper, piling said
15 sheets together, and drying the resulting mass.

2. The process of making insulating material which consists in applying silicious or
20 equivalent material to sheets of paper, piling said sheets together, and drying and baking

the resulting mass so as to consolidate the same.

3. The process of making insulating material which consists in applying to paper sheets an earthy or mineral substance with a binding material, piling said sheets together and drying and heating the resulting mass.

4. As a new article of manufacture, an insulating material consisting of layers of carbonaceous material alternating with layers of silicious material.

5. As a new article of manufacture, an insulating material consisting of layers of more or less carbonized paper and intervening layers of more or less vitrified silicious material.

In witness whereof I have hereunto set my hand, this 27th day of October, 1891.

ELIHU THOMSON.

Witnesses:

JOHN W. GIBBONEY,
ALBERT L. ROHRER.

No. 613,674.

105-106

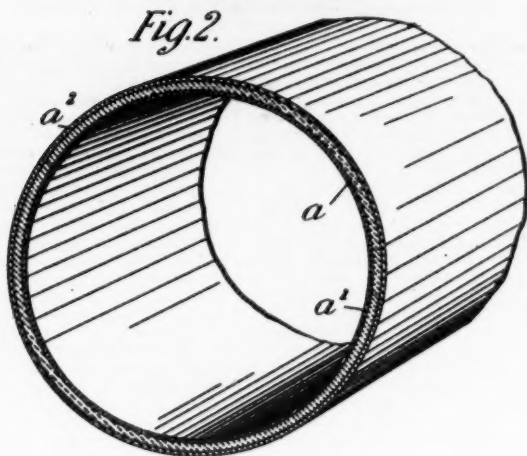
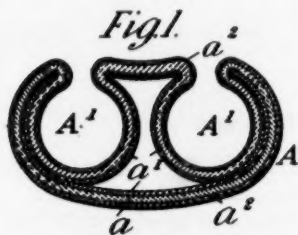
Patented Nov. 8, 1898.

J. C. GRANT.

RIM FOR CYCLE OR OTHER ROAD WHEELS.

(Application filed Jan. 26, 1897.)

(No Model.)



Witnesses

H. M. [unclear]
E. C. Masttown.

Inventor

John Cameron Grant
by Bidwell & Bidwell
Attys.

UNITED STATES PATENT OFFICE.

JOHN CAMERON GRANT, OF LONDON, ENGLAND.

RIM FOR CYCLE OR OTHER ROAD WHEELS.

SPECIFICATION forming part of Letters Patent No. 613,674, dated November 8, 1898.

Application filed January 26, 1897. Serial No. 620,782. (No model.)

To all whom it may concern:

Be it known that I, JOHN CAMERON GRANT, a citizen of England, residing at Albert Lodge, Albert Place, Kensington, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Rims or Felloes for Cycle or other Road Wheels, of which the following is a specification.

My invention has for its object the construction of a rim or felly for cycle and other road wheels that shall possess great lightness, combined with strength, toughness, and elasticity. For this purpose I construct such rims of the combination of an inner body or core made of paper-pulp or papier-mâché, preferably formed of rhea fiber, (such as *Bohemeria nivea*,) and an outer covering of a woven fabric, preferably formed of rhea fiber, which is cemented to the paper core, the whole being subjected to compression in suitable molds. By this means an exceedingly strong, tough, and yet light rim is produced. Such rims may be made of any configuration employed in the manufacture of cycle and other road wheels.

Figure 1 is a cross-section of a rim, showing one form of my invention; and Fig. 2 is a partial perspective view of the tube before it is compressed into form.

In Fig. 1 I show a rim constructed in accord-

ance with my invention and shaped to receive a tire such as set forth in my copending application, Serial No. 620,778, filed January 20, 1897, wherein two auxiliary pneumatic tubes are introduced and expanded in the tubular channels A' of the rim A. This consists of the core a, of paper material, preferably of rhea fiber, and an internal and external covering a' a'', of woven fabric, preferably of "rhea-duck." This rim is in the first instance made of the tubular form shown at Fig. 2, which after being subjected to the required degree of compression is bent in molds, so as to assume the form at Fig. 1.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

A wheel-rim consisting of a tube composed of paper material having an inner and outer layer of woven fabric, said tube being compressed and collapsed into the desired form; substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of January, A. D. 1897.

JOHN CAMERON GRANT.

Witnesses:

OLIVER IMRAY,
JNO. P. M. MILLARD.

No. 691,871.

Patented Jan. 28, 1902.

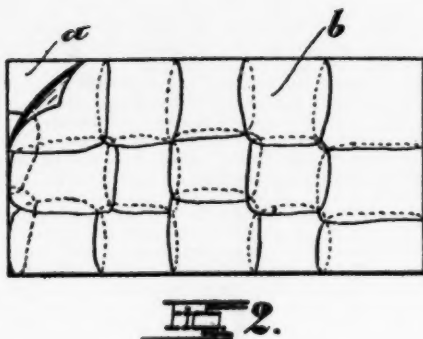
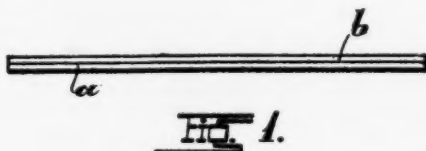
N. RAPHAEL & L. ELIAS.

INSULATING AND PACKING MATERIAL AND PROCESS OF MANUFACTURING SAME.

(Application filed Oct. 11, 1900.)

(No Model.)

109-110



WITNESSES:

Isabella Walden

Otto Munk

INVENTORS

N. Raphael
L. Elias

BY

Richard L.

111 UNITED STATES PATENT OFFICE.

MAX RAPHAEL AND LEOPOLD ELIAS, OF BRESLAU, GERMANY.

INSULATING AND PACKING MATERIAL AND PROCESS OF MANUFACTURING SAME.

SPECIFICATION forming part of Letters Patent No. 691,871, dated January 28, 1902.

Application filed October 11, 1900. Serial No. 32,723. (No specimens.)

To all whom it may concern:

Be it known that we, MAX RAPHAEL, manufacturer, of 10 Zimmerstrasse, and LEOPOLD ELIAS, manufacturer, of 37 Kaiser-Wilhelmstrasse, Breslau, Germany, have invented a new or improved Insulating and Packing Material and Process of Manufacturing the Same, of which the following is a full and clear description.

10 This invention relates to a new or improved insulating and packing material and to the method or process of manufacturing same.

15 In the drawings, Figure 1 is an edge view of the material, and Fig. 2 a plan view.

The improved material is particularly adapted for use as an electrical insulating medium. Hitherto mica has long been used as being the best insulating material for electrical purposes. Owing to the progress made in the electrical industry, such large quantities of mica are now used that the material is not only progressively rising in price, but it cannot be found in sufficient quantity in pieces of a sufficiently large size, since in the natural condition mica very seldom occurs in large formed masses compared with the quantity found of a smaller form. Although small mica is found in sufficient quantity, yet it is only capable of employment after having been brought by artificial means to such a condition as to present sufficiently large surfaces. For some time past a material known, particularly in Germany, as "micanit" has been prepared as a substitute for the larger-sized pieces of mica. This substitute consists, essentially, of the smaller pieces of mica split into thin plates and caused to adhere together by means of dissolved shellac in such a manner as to constitute larger plates. Micanit, however, possesses the disadvantage that the shellac employed becomes softened by the heat developed by the electric current, and, further, as very thinly split mica must be employed for the preparation of micanit the material contains too large a proportion of shellac. On the other hand, only thinly-split mica can be employed, as otherwise even and regular surfaces, such as are required for electrical purposes, could not be produced.

We aim by the present invention to over-

come the objection to the material known as "micanit" by rendering unnecessary the excessive use of an adhesive material, such as shellac. We prefer to dispense with adhesive material entirely; but we do not limit ourselves in this particular, as circumstances may arise where it will be desirable to use a preparation of adhesive material to augment the adhesion secured by pressure.

According to the present invention we utilize the property possessed by moistened asbestos of adhering rigidly to mica, so as to bind or unite the small pieces thereof together. The intimate union thus produced remains even after the moisture has been removed.

In carrying out this invention the small thin plates or pieces of mica *b*, Fig. 2, are laid upon the asbestos *a*, and the latter is moistened with water. The mica pieces are laid scale-like upon the asbestos, as shown in Fig. 2. Then the whole is subjected to pressure, whereby the greater proportion of the water is removed. By reason of the adhesion between the asbestos and the pieces of mica the latter are as firmly and rigidly bound together as the individual laminae in the natural mica. Any moisture still remaining behind is removed by further pressing and simultaneously drying by application of heat or other suitable means, since it is obvious that an insulating material must contain no moisture. As the asbestos, which constitutes the binding material for the mica, is an extremely porous material, it will contain air in a very finely divided condition in its pores, so that the new material is built up of mica, air, and asbestos. It is obvious that the manufacture of the new insulating material is not limited to its production in the form of flat plates or sheets, but that it can be molded to any suitable shape.

It will be understood that as this new material is made from incombustible substances which will resist practically any pressure it may therefore be employed very advantageously as a packing material.

In accordance with the process herein described the insulating or packing material, consisting of asbestos and mica, is made up without the employment of an adhesive ma-

material. In this manner the material is essentially superior to the other materials of asbestos and mica which have always an adhesive in their make-up. The adhesive has the drawback that it changes, softens, or sweats from influences of heat, as the adhesive consists of an organic substance. Thus when the adhesive materials are absent from the material which consists of asbestos and mica (which are inorganic) such mutation of the insulating material and injury to the insulating effect are not to be feared. In the process or method under consideration the asbestos is moistened with water, and after admixing water the mass is compressed. By the adhesion through which the moistened asbestos adheres to the mica a reliable connection is established between the two materials. This connection remains established even if the moisture between the two materials passes away completely.

We claim—

1. An insulating material consisting of a layer of mica formed of small pieces of mica arranged scale-like upon each other and a separate layer of asbestos, said layers being

directly connected with each other, substantially as described.

2. An insulating material consisting of independent layers of mica and asbestos attached together, the said mica being in the form of small flakes or scales, and the asbestos being pressed into contact therewith.

3. The herein-described process of making insulating material consisting in applying moisture free from adhesive to an asbestos layer and pressing flakes or scales of mica into contact therewith, substantially as described.

4. The process of producing an insulating packing material composed of asbestos and mica, consisting in moistening the asbestos with water and pressing the mica and asbestos together, substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

MAX RAPHAEL
LEOPOLD ELIAS.

Witnesses:

RUDOLF FLEISS,
HERMANN BARTSCH.

113-114

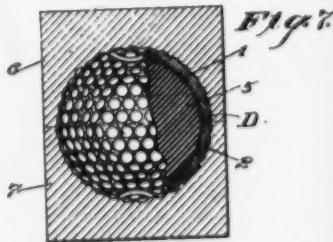
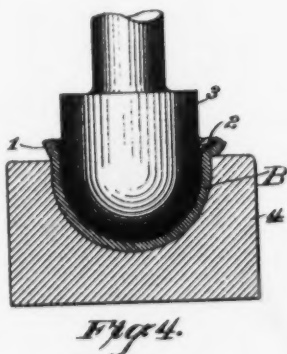
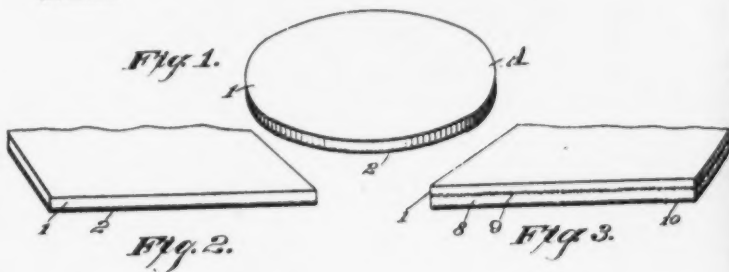
No. 700,656.

Patented May 20, 1902.

E. KEMPSHALL.
SHELL BLANK FOR PLAYING BALLS.

(Application filed Mar. 19, 1900.)

(No Model.)



Witnesses:

Edw. C. Maynard
Chas. H. Pittman

Inventor
Eliaser Kempshall
By His Attorney,
F. W. Richard.

UNITED STATES PATENT OFFICE. 115

ELEAZER KEMPSHALL, OF BOSTON, MASSACHUSETTS. ASSIGNOR TO THE KEMPSHALL MANUFACTURING COMPANY, A CORPORATION OF NEW JERSEY.

SHELL-BLANK FOR PLAYING-BALLS.

SPECIFICATION forming part of Letters Patent No. 700,656, dated May 20, 1902.

Application filed March 19, 1902. Serial No. 98,976. (No model.)

To all whom it may concern:

Be it known that I, ELEAZER KEMPSHALL, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Shell-Blanks for Playing-Balls, of which the following is a specification.

This invention relates to shell-blanks for playing balls, especially those used in the game of golf; and its object is to improve the stanchness and other qualities of the blanks or shells. The blank I prefer to make of celluloid, which I line with fabric, thereby enabling the shell to be thoroughly cemented to the core of the ball, the fabric being embedded in the celluloid and adhering to the core.

In the accompanying drawings, Figure 1 is a perspective view of a disk of compound material used in forming a half-shell. Fig. 2 shows a sheet from which the Fig. 1 device may be cut. Fig. 3 shows material having two plies of fabric and two of celluloid. Fig. 4 shows one stage in cupping the material to form a half-shell. Fig. 5 is a perspective of the device formed by the Fig. 4 operation. Fig. 6 shows a completed half shell or blank, and Fig. 7 shows how blanks made according to my invention may be applied to a golf-ball.

In the several views similar parts are designated by similar characters of reference.

To a sheet of celluloid 1 I apply a sheet of fabric 2, preferably having an open mesh, and these sheets I subject to heat and great pressure, the pressure being maintained until the shell hardens and the fabric becoming embedded in the celluloid, so that it is difficult or impossible to separate them. From this material I cut a disk A, Fig. 1, which I cup by means of a rounded plunger-die 3 and a corresponding cup-die 4, the celluloid being first heated and rendered soft or plastic, thus facilitating the forming action of the dies, and the plunger 3 and the die 4 being brought together with great force, so as to still further solidify and season the material. The pressure is maintained until the celluloid of the cup cools and

hardens. The cup produced by this process is indicated by B, Figs. 4 and 5. From this article I cut off the surplus material, thus forming a substantially hemispherical fabric-lined shell-blank, as at C, Fig. 6. I then cement a pair of these half-blanks upon a spherical filling 5, Fig. 7, and subject the whole to heat and compression, so as to weld the edges of the half-blanks together at D, Fig. 7, and also to place the core 5 under compression. The compression of the dips 6 and 7 upon the ball is maintained until the shell cools and hardens, so that when taken out of the dies the shell is enabled to retain its shape and hold the core permanently under compression. Usually the celluloid shrinks after the ball is completed, whereby the core is more firmly gripped by the shell.

Instead of the Fig. 2 material that used at Fig. 3 may be employed, having two plies of celluloid 1 and 8, an intervening-ply of fabric 9, and the lining fabric 10, and, if desired, additional plies of celluloid and fabric may be used, and the thickness of the shell may be varied according to the character of the ball.

By lining the celluloid with fabric the cementing of the shell to the core 5 is facilitated. The fabric, by reason of its being embedded in the celluloid and practically inseparable therefrom, holds the latter firmly to the core, so that when the ball is distorted by a severe blow from the implement disruption of the shell from the core is prevented, and hence the life of the ball is greatly prolonged. The welding of the shell at D enables the latter to hold the core under compression, while the fabric toughens the shell and prevents too sharp indentation thereof when struck by a blow, and hence saves the shell from fracture.

In using the term "celluloid" I mean to include all materials of the pyroxylin class. Plastic material other than celluloid or pyroxylin may be employed within the scope of my invention.

Having described my invention, I claim—

1. A partial shell for a playing-ball, comprising a layer of plastic material lined with fabric.

2. A half-shell for a playing-ball, comprising layers of plastic material and layers of fabric in alternation, one of said fabric layers forming a lining for the half-shell.
- 5 3. A partial shell for a playing-ball, consisting of celluloid in which fabric is embedded.
4. A hemispherical shell-blank consisting of celluloid having a lining of fabric.
- 10 5. A hemispherical shell-blank consisting of plies of celluloid and plies of fabric, one of said fabric plies forming a lining for the shell, and all of said plies being compacted together.
- 15 6. A process in forming a shell-blank, consisting in compacting together under heat and pressure a ply of fabric and a ply of celluloid, maintaining the pressure until the celluloid cools and hardens, cupping the material under heat and pressure, and maintaining the pressure until the celluloid cools and hardens.
- 20 7. A process in forming a shell-blank, consisting in compacting together under heat and pressure a ply of fabric and a ply of celluloid, maintaining the pressure until the celluloid cools and hardens, cupping the material under heat and pressure, maintaining the pressure until the celluloid cools and hardens, and trimming off the surplus material.
- 30 8. A process in producing a playing-ball, consisting in compacting under heat and pressure plies of celluloid and alternate plies of fabric, maintaining the pressure until the celluloid cools and hardens, cupping the material under heat and pressure, and maintaining the pressure until the celluloid rehardens.
- 35 9. A process in forming a partial shell for a playing-ball, consisting in cupping under heat and pressure plies of fabric and celluloid, and maintaining the compression until the shell hardens.
10. A process in forming a half-shell for a playing-ball, consisting in cupping under heat and pressure plies of fabric and celluloid, maintaining the compression until the shell hardens, and cutting off the surplus material.
11. A process in producing a shell-segment for a playing-ball, consisting in cupping under heat and pressure plies of celluloid and alternate plies of fabric, and maintaining the pressure until the shell hardens.
12. A process in forming shell-blanks for playing-balls, consisting in cupping plies of fabric and plastic material under heat and pressure so that the fabric forms a lining for the cup, and maintaining the pressure until the plastic material hardens.
13. A process in forming shell-blanks for playing-balls, consisting in cupping plies of fabric and celluloid under heat and pressure so that the fabric forms a lining for the cup, and maintaining the pressure until the celluloid hardens.
14. A process in forming hemispherical shell-blanks for playing-balls, consisting in cupping plies of fabric and celluloid under heat and pressure so that the fabric forms a lining for the cup, maintaining the pressure until the shell hardens, and trimming off the surplus material.

ELEAZER KEMPSHALL.

Witnesses:

B. C. STICKNEY,
JOHN O. SKIFFERT.

C. T. KINGZETT.
PROCESS OF MAKING PLAYING BALLS.
APPLICATION FILED NOV. 12, 1902.

117-118

NO MODEL.

Fig. 1.

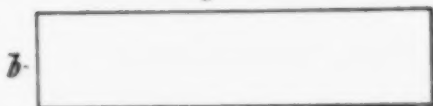


Fig. 2.

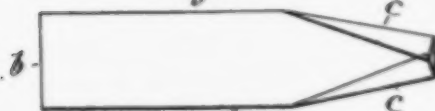


Fig. 3.

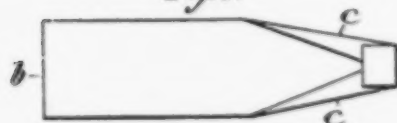


Fig. 4.



Fig. 5.

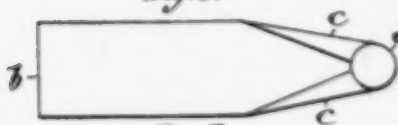


Fig. 6.



Fig. 7.

Fig. 8.

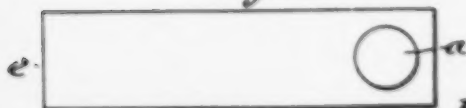


Fig. 9.

Fig. 10.



Witnesses
J. M. Perkins.
J. A. McDermott.

Inventor.
Charles T. Kingzett,
By his Attorneys,
Rudolph T. Smith & Co.

119 UNITED STATES PATENT OFFICE.

CHARLES THOMAS KINGZETT, OF CHISLEHURST, ENGLAND.

PROCESS OF MAKING PLAYING-BALLS.

SPECIFICATION forming part of Letters Patent No. 784,888, dated July 28, 1902.

Application filed November 13, 1901. Serial No. 131,360. (No model.)

To all whom it may concern:

Be it known that I, CHARLES THOMAS KINGZETT, manufacturer, a subject of the King of Great Britain, residing at Elmstead Knoll, Chislehurst, in the county of Kent, England, have invented certain new and useful improvements in Processes of Making Playing-Balls, of which the following is a specification.

This invention has reference more especially to golf-balls, but is also applicable to balls used in other games.

Golf-balls have before been made with a central core of vulcanized india-rubber or with a central core of hard material surrounded by a thick layer of vulcanized india-rubber which in turn is itself incased in a thick outer shell of gutta-percha. Such layer of india-rubber has either been formed of two hemispherical cups or of india-rubber tapes or threads wound around the core under tension.

In the manufacture of my golf-ball I employ non-vulcanized india-rubber softened externally by being steeped in a volatilizable solvent, such as carbon disulphide or benzine, and use such softened rubber, still moist with solvent, in conjunction with gutta-percha in alternating layers, which by the solvent are caused to unite the one with the other and form a solid sphere. The exterior of the balls I form, as heretofore, of a thick outer shell of gutta-percha.

The drawings annexed illustrate the manner in which I prefer to proceed.

Figure 1 is a plan view of a length of a broad tape or strip of india-rubber previously softened by being steeped in a volatilizable solvent. Fig. 2 is a plan of the same tape with the two side portions at one end folded over inward. Fig. 3 is a plan of the same when this end has been rolled up into a small roll while continuing to fold over inward the two side portions. Fig. 4 is a longitudinal section of Fig. 3. Fig. 5 is a plan of the same with the small roll squeezed into approximately spherical form. Fig. 6 is a section of a sphere of softened india-rubber formed by rolling up the remainder of the tape around the small sphere previously formed. Fig. 7 is a plan view of the sphere placed onto a broad tape of gutta-percha.

Fig. 8 is a section of a sphere formed by rolling the gutta-percha tape around the softened-india-rubber sphere and squeezing it into approximately spherical form. Fig. 9 is a section of a sphere formed by repeating these operations—that is, by similarly winding on first a tape of softened india-rubber and then a tape of softened gutta-percha. Fig. 10 is a section of a sphere such as shown in Fig. 9 incased in a thick outer casing of gutta-percha.

I first form a central approximately spherical core *a* of rubber from a broad tape or strip *b* of india-rubber which has previously been softened on the exterior by being steeped in a volatilizable solvent. To form the tape *b* into a solid spherical mass, I commence by bending inward toward one another the two side edges or portions *c* of one end of the tape, as illustrated in Fig. 2, while at the same time winding up tightly this end of the tape into a roll, as illustrated in Fig. 3, and squeezing together the several folds and turns of the rubber tape, so as to make them all lie here closely together and assume more or less of a spherical form *d*, as illustrated in Fig. 5, and continue the winding and bending over of the sides of the tape until a core of the desired size has been produced, as illustrated in Fig. 6. Over this core *a* I next in the same way wind and bend around a similar tape *e* of gutta-percha previously softened by heat, so as to form around the core a complete hollow shell *f* of gutta-percha, as illustrated in Fig. 8. After this I again wind and bend around the gutta-percha-covered core another tape of rubber previously softened by a volatilizable solvent, and to make up of obtaining perfect union between the rubber and gutta-percha and between the several overlapping folds and turns of the rubber tape more volatilizable solvent may be applied to the india-rubber in course of or after winding. The alternately winding on of softened gutta-percha tape and a tape of rubber moistened with a volatilizable solvent repeated until the thick exterior coating of gutta-percha has to be formed. This outer coating may be formed in the same way by winding on and pressing together softened tapes of gutta-percha until the desired thickness is reached.

is obtained, or it may be formed of two hemispherical cups of gutta-percha. Afterward the whole may be compressed together and brought to the required spherical form by being compressed between dies. Thus the inner portion of the ball may be composed of numerous alternate concentric layers of india-rubber and gutta-percha, all made to adhere one with the other by the volatilizable solvent used. Each of the india-rubber layers also becomes one solid layer of india-rubber however many thicknesses or folds of the tape there may be in the layer.

In place of making the central core or nucleus of softened rubber, as above described, a core or nucleus of other material might be used; but generally it is better to form it of rubber.

In place also of alternately winding around the core first a tape of gutta-percha and then a tape of india-rubber moistened with solvent the rubber might by steeping in the solvent be brought into a softened plastic state and then spread over the surface of gutta-percha tapes, and such compound tapes may then be wound up and made into spherical balls in the way above described, or similar compound tapes for making up into balls might be formed by pressing tapes of india-rubber which have been previously softened by immersion in solvent onto tapes of gutta-percha, so as to make them adhere the one to the other.

What I claim is—

1. The hereinbefore-described process of forming a ball such process consisting in first steeping india-rubber in a volatilizable solvent and afterward molding such softened rubber together with strips of softened gutta-percha in alternating layers into a spherical mass.

2. The hereinbefore-described process of forming a ball such process consisting in first steeping india-rubber in a volatilizable solvent and afterward molding such softened rubber together with strips of softened gutta-percha in alternating layers into a spherical mass and then inclosing such compound spherical mass in an outer casing of gutta-percha.

3. The hereinbefore-described process of forming a ball such process consisting in first steeping strips or tapes of india-rubber in a volatilizable solvent and then molding such softened and moistened rubber and softened

strips or tapes of gutta-percha into alternating concentric approximately spherical layers.

4. The hereinbefore-described process of forming a ball such process consisting in first steeping strips or tapes of india-rubber in a volatilizable solvent and then molding such softened and moistened rubber and softened strips or tapes of gutta-percha into alternating concentric approximately spherical layers and afterward inclosing the compound mass in an outer casing of gutta-percha.

5. The hereinbefore-described process of forming a ball such process consisting in first steeping strips or tapes of india-rubber in a volatilizable solvent and subsequently winding such softened and moistened strips and softened strips of gutta-percha alternately around a central nucleus so as to form around the nucleus a series of alternating approximately spherical layers of india-rubber and gutta-percha all united the one with the other.

6. The hereinbefore-described process of forming a ball such process consisting in first steeping strips or tapes of india-rubber in a volatilizable solvent and subsequently winding such softened and moistened strips and softened strips of gutta-percha alternately around a central nucleus so as to form around the nucleus a series of alternating approximately spherical layers of india-rubber and gutta-percha all united the one with the other and afterward inclosing the compound mass in an outer casing of gutta-percha.

7. The hereinbefore-described process of forming spherical layers of solid india-rubber around a central nucleus such process consisting in winding bending and compressing a strip or tape of india-rubber previously steeped in a volatilizable solvent around the nucleus until the required thickness of layer is obtained with all the several turns and folds of this winding adhering together and forming one compact mass.

8. The hereinbefore-described process of forming a solid spherical core of dense but very elastic india-rubber such process consisting in first steeping a strip or tape of india-rubber in a volatilizable solvent and winding up and bending such tape into a solid spherical mass.

CHARLES THOMAS KINGZETT.

Witnesses:

WILLIAM HOLMES,
CHARLES BECKENSALL.

52

121-122

No. 803,816.

PATENTED NOV. 7, 1905.

W. L. R. EMMET.
INSULATING MATERIAL.
APPLICATION FILED NOV. 24, 1900.

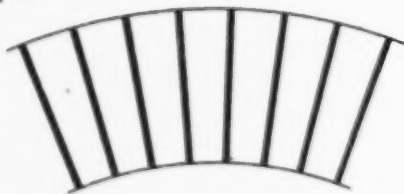
Fig. 1.



Fig. 2.



Fig. 3.



Witnesses.

John Ellis Glauert
Benjamin B. Hill

Inventor.

William Le R. Emmet
by *Albert G. Davis*
Atty.

UNITED STATES PATENT OFFICE. 123

WILLIAM L. R. EMMET, OF SCHENECTADY, NEW YORK, ASSIGNOR TO
GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

INSULATING MATERIAL.

No. 808,818.

Specification of Letters Patent.

Patented Nov. 7, 1906.

Application filed November 24, 1906. Serial No. 37,584.

To all whom it may concern:

Be it known that I, WILLIAM L. R. EMMET, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Insulating Material, of which the following is a specification.

My invention relates to materials having high dielectric qualities, so that they can be used for insulating portions of electrical apparatus having different potentials. The invention is especially designed for insulating the segments of the commutators of dynamo-electric machines. One of the best-known materials for this purpose is mica, which has very high insulating and heat-resisting properties, so that it is especially valuable in building up commutators; but mica comes in comparatively thin sheets, and when a thick sheet is required it must be built up from several thin ones. This building process cannot be carried to any great extent, since the mica varies in thickness and the piling up of a number of sheets produces an unevenness in gage which is very objectionable. Moreover, the mica does not wear down as fast as the copper segments of the commutator, so that in time the surface of the commutator becomes rough by reason of the projecting edges of the mica strips, causing the brushes to jump and spark.

The object of my invention is to provide a substitute for mica which shall have high dielectric and refractory qualities, can be made of any desired thickness and of uniform gage, is hard and incompressible, will not shrink, and will wear away as rapidly as the commutator, so as to preserve a smooth surface.

Certain vegetable oils, and especially linseed-oil, become oxidized when exposed to the air, forming a tough elastic substance resembling caoutchouc and capable of resisting a high degree of heat.

My invention consists in an insulating material composed of one or more sheets of a refractory absorbent substance, such as asbestos paper, treated with an oxidizable vegetable oil or a compound containing it, dried or otherwise treated to oxidize said oil and then baked. When more than one sheet of paper is used, they are separately treated and then united by pressure before baking.

In the drawings, Figure 1 shows a piece of

my insulating material. Fig. 2 is a cross-section on an exaggerated scale. Fig. 3 shows a portion of a commutator.

The asbestos paper A is the ordinary commercial article. Thin sheets of this are dried and then dipped in a varnish composed wholly or in part of boiled linseed-oil. I prefer a compound of oil and gum-copal, preferably made by pouring six parts of the copal into eleven parts of the boiling oil and when cool adding turpentine, benzine, or other oil to thin it to the proper consistency. This compound dries quicker and bakes harder than the boiled oil alone. The separate sheets of paper are first heated to dry them and then dipped hot in this varnish, being preferably dipped twice, and air-dried after each dipping to oxidize the varnish. They are then piled up and subjected to pressure in a heated press until the varnish softens and the sheets stick together. A pad may be placed under the plunger of the press to distribute the pressure evenly. The product is then removed from the press and is baked for about twenty-four hours, more or less, at a temperature higher than that to which it will be subjected in practice. If it should happen to be underbaked, the heat to which it is exposed in a rapidly-running commutator will act to harden and improve the varnish. The composite plate built up in this way is composed of alternate thin layers of oxidized and hard-baked glaze or varnish B and asbestos A. The asbestos is an excellent heat-resisting and insulating substance, and the varnish distils down under the heat of the press and the baking-oven to a condition in which it, too, is a good heat-resisting and insulating material. Moreover, if there are any metallic impurities in the asbestos paper, such as particles of iron, they will be prevented from forming a short circuit through the mass by the intervening layers of refractory oxidized varnish.

The composite sheet is smooth and of even thickness, so that when a commutator is assembled all the bars can be brought accurately to a given circumferential size and the clamping devices will bear evenly on all of them.

Another advantage of my invention is that while the material is hard and practically non-compressible, so that when used in a

commutator it preserves its even thickness and makes the commutator a solid rigid structure, yet it is comparatively brittle, so that it crumbles away under the brushes as fast as the surface of the commutator is reduced by wearing and burning off. This preserves a smooth surface on the commutator and avoids the roughness which invariably results when mica insulation alone is used, mica being so much harder than the copper segments, and therefore resisting the causes which tend to reduce the size of the commutator.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An electric insulating material composed of multiple layers of an absorbent refractory insulating material united by films of vegetable oil, each of said films being baked hard on one of said layers.

2. An electric insulating material composed of a plurality of sheets of asbestos and layers of oxidized linseed-oil baked hard on the several sheets and serving to unite them.

3. An electric insulating material, com-

posed of asbestos coated with hardened compound of linseed-oil and gum-copal.

4. An electric insulating material, composed of sheets of asbestos united by intervening layers of hard oxidized vegetable varnish.

5. An electric insulating material, composed of sheets of fibrous refractory material united by an oxidized compound of linseed-oil and gum-copal.

6. The method of making an insulating material, which consists in dipping sheets of asbestos paper into a compound of boiled linseed-oil, gum-copal and a suitable flux, air-drying said sheets, piling them together, subjecting them to heat and pressure to consolidate them, and then baking the composite sheet thus formed.

In witness whereof I have hereunto set my hand this 22d day of November, 1900.

WILLIAM L. R. EMMET.

Witnesses:

BENJAMIN B. HULL,
GEO. P. WHITTLESEY.

No. 840,401.

125-126

PATENTED JAN. 1, 1907.

E. F. UPTON.

HARD RUBBER COMPOSITION BALL AND PROCESS OF MAKING THE SAME.

APPLICATION FILED MAY 3, 1906.

Fig. 1.

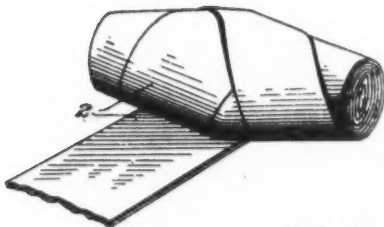


Fig. 2.

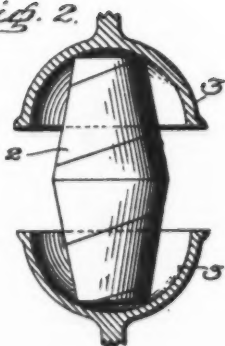


Fig. 3.

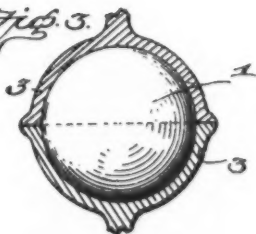
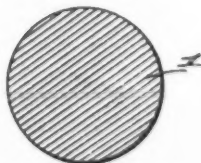


Fig. 4.



Witnesses

E. F. Upton

C. N. Krieger

Inventor
E. F. Upton

by *A. H. Wilson & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

EDMUND F. UPTON, OF MINERAL CITY, OHIO, ASSIGNOR OF ONE-FOURTH TO E. VAN KIRK, ONE-FOURTH TO D. O. VAN KIRK, AND ONE-FOURTH TO M. E. FISHER, OF MINERAL CITY, OHIO.

HARD-RUBBER-COMPOSITION BALL AND PROCESS OF MAKING THE SAME.

No. 940,401.

Specification of Letters Patent.

Patented Jan. 1, 1909.

Application filed May 3, 1906. Serial No. 315,089.

To all whom it may concern:

Be it known that I, EDMUND F. UPTON, a citizen of the United States, residing at Mineral City, in the county of Tuscarawas and State of Ohio, have invented certain new and useful Improvements in Hard-Rubber-Composition Balls and Processes of Making the Same; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in hard-rubber-composition balls and the process of making the same.

The object of the invention is to provide an improved construction of hard-rubber-composition ball and the process of manufacturing the same, whereby a solid, strong, and durable ball is formed having more or less resilient qualities.

With the above and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a perspective view showing the manner of winding the strips of which the ball is composed. Fig. 2 is a side view, partly in section, showing the roll of strips in the dies ready to be pressed. Fig. 3 is a similar view of the ball after being pressed, and Fig. 4 is a sectional view of the finished ball.

Referring more particularly to the drawings, 1 denotes the ball, which is constructed from a strip or series of strips 2 wound upon themselves to form an elongated roll, the axis of which is greater than the width of the strip, which tapers slightly from the center toward its ends, as shown in Fig. 1. The strips 2 are preferably formed of a composition of rubber and other ingredients.

In forming a ball the strips are preferably rolled by hand into the form hereinbefore described, after which said roll is placed in a two-part mold or die 3, each part of which is preferably hemispherical in shape. After the roll has been thus placed in the dies pressure is applied thereto and the roll of strips compressed endwise into a solid spherical form, as shown in Fig. 3 of the drawings. By

forming a ball in this manner and subjecting the same to hydraulic or other high pressure a compact solid construction will be had which will possess more or less resilience and which will not readily split or chip off.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportions, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention as defined by the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of making balls which consists in winding strips of material diagonally upon each other, and then pressing said wound strips into a spherical body.

2. The process of making balls which consists in winding strips of elastic material diagonally upon each other, and then pressing said so-wound strips into a solid spherical body.

3. The process of making balls from sheets or strips of material, said sheets being wound into an oblong body, the axis of which is greater than the width of the strip, and then exerting an endwise pressure on the body to form it into a solid, spherical body.

4. The process of making balls of sheets of elastic composition, said strips being rolled together to form an elongated body, the axis of which is greater than the width of the strip and then compressing said body endwise to form it into a spherical body.

5. A ball comprising an endwise compressed coil composed of a strip of diagonally-crossed elastic material.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDMUND F. UPTON

Witnesses:

D. O. VAN KIRK,
E. VAN KIRK.

No. 858,384.

PATENTED JULY 2, 1907.

E. HAEFELY.
MANUFACTURE OF INSULATING TUBES.
APPLICATION FILED SEPT. 6, 1904.

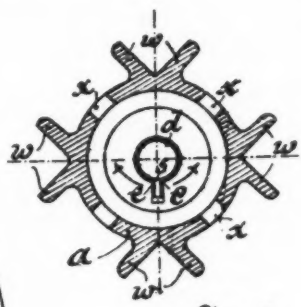
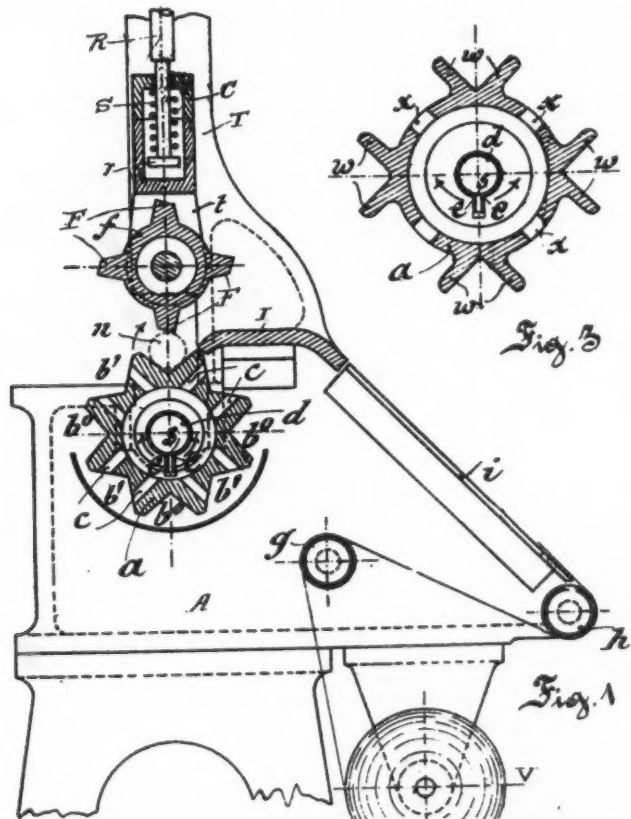
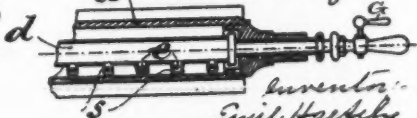
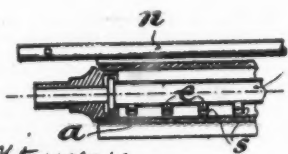


Fig. 3

Fig. 1



Fig. 2



Witness:
E. W. Bond
J. R. Roman

Inventor:
Emil Haefely
By: W. C. Roullet
Attorney.

U.S.D.C., S.D. of Chio. W.D.
W.E. & M. Co. v. Fomica Ins. Co.
Equity No. 201.

Plaintiff's Exhibit Haefely Patent No. 858,384, Claims
suit 2,3,4

UNITED STATES PATENT OFFICE.

EMIL HAEFELY, OF BASEL, SWITZERLAND, ASSIGNOR TO WESTINGHOUSE ELECTRIC &
MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

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MANUFACTURE OF INSULATING-TUBES.

No. 858,384.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed September 8, 1904. Serial No. 232,443.

To all whom it may concern:

Be it known that I, EMIL HAEFELY, a citizen of the Republic of Switzerland, residing at Basel, in Switzerland, have invented certain new and useful Improvements in the Manufacture of Insulating-Tubes, of which the following is a specification.

My invention relates to the manufacture of insulating tubes and more particularly to machines for manufacturing insulating tubes of comparatively small diameters.

The object of my invention is to provide means which shall be simple and compact in construction and durable and efficient in operation and a method by which insulating tubes may be produced which shall have important qualities and characteristics not heretofore pertaining to tubes manufactured by other means and other methods.

The apparatus devised and utilized by me for manufacturing insulating tubes comprises a heated mandrel holder having a longitudinal recess of angular cross section and a pressure device, the axis of which is parallel to that of the mandrel holder and one side or edge of which rests upon the material of which the tube is formed in such manner that a constant and uniform pressure is exerted upon such material during the winding operation.

In the accompanying drawing, Figure 1 is a view partially in side elevation and partially in section of the principal portions of a machine constructed in accordance with my invention. Fig. 2 is a longitudinal section of a mandrel holder and means for heating the same, a portion being broken away to indicate that the said parts may be of greater length than is here shown. Fig. 3 is a cross sectional view of modified form of mandrel holder.

Mounted in a suitable frame A is a mandrel holder a the ends of which are closed and the length of which is approximately the same as the maximum length of tube which it is desired to produce. As here shown, the surface of the mandrel holder a is provided with eight longitudinal recesses which are of angular or substantially V-shape in cross section and which extend the entire length of the holder, parallel to the axis thereof and are designated by the letters b' and b'', the recesses b' being of the same shape and dimensions as the recess b'' but alternating in position therewith. The interior of the mandrel holder a communicates with the exterior by means of passages c which are uniformly spaced and the outer ends of which terminate in the recesses b'.

A gas pipe d extends through the interior of the mandrel holder a and is supported in the ends thereof, suitable connections being made between one end of the pipe and a supply hose as indicated in Fig. 2. The under side of the gas pipe d is provided with a series of uni-

formly spaced branch tubes e which are closed at their 55 outer ends and are provided with lateral openings v.

Above the mandrel holder a is located a pressure device f which is here shown as provided with a plurality of longitudinal ribs F, the edges of which are slightly chamfered or beveled for a reason which will be hereinafter more fully set forth. The pressure device f is supported by a cross bar t which is free to move vertically in guides provided in the standards T of the frame A, any suitable gearing or other means being provided for raising the said cross bar when the pressure device is not in use. In order that the pressure device f may exert a constant and uniform pressure upon the work and in order that it may be brought into engagement and separated from the work without sudden shock, I provide a lost motion connection between it and the raising and lowering mechanism, such mechanism being here indicated by a rod R, the lower end of which projects into a chamber C with which the cross bar t is provided. A coil-spring S is located in the chamber C so that its upper end may engage the upper side of the chamber and its lower end may engage a head r on the lower end of the rod R.

The paper or other fabric which constitutes one of the principal elements of my product is supported in the form of a roll in suitable bearings in the frame A, as indicated at V and the paper drawn therefrom passes over a tension roller g, a guide roller h and a table i to a mandrel n of the proper size which rests in the upper recess b'' of the mandrel holder.

When using the machine above described in accordance with my invention, the gas cock G in the hose connection to the gas pipe d is opened and the gas which escapes through the openings e in the branch pipes s is lighted. The air required for supporting combustion is admitted through the passages c, the outer ends of which are at the lower side of the mandrel holder a and the products of combustion escape through the passages c, the outer ends of which are at the upper side of the mandrel holder, the heat generated within the mandrel holder being thus imparted with substantial uniformity to the outer or shell portion throughout its periphery and length. The products of combustion which issue from the upper right hand passages c serve to heat the frame portion I which is interposed between the inclined table i and the mandrel n so that the material fed to the mandrel may be heated to a desired temperature before reaching the mandrel.

As the paper or other fabric is drawn from the roll V over the table i it is provided with a coating of varnish or other suitable binder and the free end is wound close around the mandrel either in the position in which the mandrel is shown or, more conveniently, at the left of the pressure device as indicated in Fig. 1, after which

the mandrel is returned to the position indicated and is rotated at the speed desired, either mechanically or by hand, in a clockwise direction so as to apply the fabric with the varnish coating between successive layers. As soon as the single layer of material is wound upon the mandrel and the latter is placed in the recess P the pressure device f is lowered until the entire weight of it and the bar i rests upon the material on the mandrel. Inasmuch as the recess b^o is of angular or Y-shape in cross section and the pressure exerted from above is uniform and constant, the progressively increasing diameter of the tube, as it is formed, does not effect any variation in the degree of density of the material.

While the device manufactured by my machine may consist solely of paper or other suitable fabric and varnish, I prefer to combine mica therewith and, when so combined, thin sheets of mica are placed upon the coating of varnish as it passes to the mandrel.

Inasmuch as the varnish is heated to a comparatively high temperature in passing over the heated portion I of the frame, all volatile constituents are driven off, leaving a layer of uniform consistency and without air bubbles or other particles which might serve to impair the quality of the insulating tube when completed. On account of the continuously applied uniform pressure, no varnish in excess of the amount required as a binder can remain upon the fabric as it is wound upon the mandrel and a tube of absolute uniformity as to consistency and dimensions and having extraordinary insulating qualities and durability is therefore produced.

In the modification shown in the Fig. 3 the mandrel holder a' is provided with a plurality of angularly disposed ribs w which form between them the angular recesses b^o , like those shown in Fig. 1. For the purpose of supplying the necessary air to promote combustion and in order to permit of the escape of the products of combustion, openings or passages x are provided at regular intervals between the ribs w .

It will be understood from the illustration and the foregoing description that only one of the angular recesses b^o is utilized for the reception of a mandrel at any one time and that the form of the mandrel holder may be varied within wide limits without departing from my invention so long as it is provided with an angular longitudinal recess for the reception of mandrels of different diameters and also with suitable means for applying the necessary heat, whether such means be gas flames, as indicated, or electricity or steam. It is to be understood, however, that whether the mandrel holder be of general cylindrical contour and whether it be provided with one or several longitudinal angular recesses, it should be so formed as to present material of substantially uniform thickness throughout its periphery and length in order that it may not be warped by the application of heat. I have learned from practical experience, extending over a long period of time, that in order to obtain a product that shall be uniform in dimensions as well as in density, the mandrel holder must be of substantially uniform contour so as to avoid the distortion which is otherwise produced by the heat.

While I have shown the pressure device f as having a plurality of pressure ribs F , it will be understood that only one such rib is in service at any one time and that the number of such ribs is therefore immaterial, unless

they are of different thickness. The shape of the outer edge of the rib here indicated is not absolutely essential but in order to secure the desired application of pressure and avoid any possible injury to the material as it is moved beneath and in contact with the rib surface, it is desirable that the edge toward which the material moves shall be cut away in some manner and the shape here shown is perhaps more practical than any other, since it not only permits the free passage of the material without danger of injury but it is also easily and cheaply formed and insures the application of pressure substantially along a single line, thus providing three lines of pressure approximately 120^o apart, which I have found best adapted for this work.

The details of construction may be otherwise modified or added to without departing from my invention and I therefore desire to include within the scope of my claims all variations and modifications which are not excluded by the prior art.

I claim as my invention:

1. A machine for manufacturing insulating tubes comprising a mandrel holder provided with a longitudinal groove of angular cross section to receive a mandrel upon which a coated fabric is wound, a pressure device located above said mandrel and supported upon the outer layer of fabric during the winding operation.
2. A machine for manufacturing insulating tubes comprising a mandrel, a longitudinally recessed mandrel holder, a pressure device that rests upon the material wound upon said mandrel and means for heating the material as it passes to said mandrel and is wound thereon.
3. A machine for manufacturing insulating tubes comprising a mandrel, a mandrel holder having a longitudinal recess in which the mandrel is rotated, a pressure device that is supported upon the layer of material wound upon the drum, and means for heating the material during the winding operation.
4. A machine for manufacturing insulating tubes comprising a mandrel upon which coated fabric is wound, a mandrel holder having a longitudinal recess of angular cross section in which the mandrel is rotated, a pressure device located above the mandrel and resting upon the tube during the winding operation and means for heating the material as it is wound.
5. In a machine for manufacturing tubes, the combination with a mandrel and a holder having a longitudinal recess to receive the mandrel, of means for feeding a sheet of fabric to the mandrel and a pressure device which exerts a constant and downward pressure upon the material on said mandrel and means for heating the material as it passes to and is wound upon said mandrel.
6. In a machine for manufacturing tubes, the combination with a rotatable mandrel and a mandrel holder having a longitudinal angular recess to receive the mandrel, of means for feeding sheet material to said mandrel and a vertically adjustable pressure device that engages the surface of the material as it is wound upon the mandrel and the weight of which is entirely supported by such material, and means for heating the material as it passes to and is wound upon the mandrel.
7. In a machine for manufacturing tubes, the combination with a cylindrical mandrel and a hollow mandrel holder having lateral passages leading from its interior to its exterior and having a heating device located therein, of means for feeding sheet fabric to the mandrel and a pressure device that exerts a constant and uniform downward pressure upon the tube as it is formed upon the mandrel.
8. In a machine for manufacturing tubes, the combination with a frame, a mandrel holder having a longitudinal recess of angular cross section and having internal heating means, of a mandrel adapted to rest in said recess, means for feeding sheet material to said mandrel to be wound around the same and a pressure device which exerts a downward, uniform and constant pressure upon the tube during its formation.

9. In a machine for manufacturing tubes from sheet material, the combination with a frame and a hollow, internally heated mandrel holder supported therein, of a mandrel adapted to receive the sheet material to form the tube and to rest upon said mandrel holder, of a pressure device which rests upon the material as it is wound upon the mandrel and exerts a constant and uniform pressure thereon.

10. In a machine for manufacturing tubes, the combination with a frame and a hollow, internally heated mandrel holder, having a plurality of angular, longitudinal recesses in its outer surface and lateral passages between its interior and some of the external recesses, of a cylindrical mandrel adapted to be received in one of said recesses, means for feeding sheet material to said mandrel to be wound thereon and a pressure device which exerts a downward, constant and uniform pressure upon the material as it is wound upon the mandrel.

11. In a machine for manufacturing tubes from sheet material, the combination with a mandrel and a mandrel holder, and means for heating the same, the material of the holder being so disposed as to be uniformly heated, of means for feeding sheet material to the mandrel and a pressure device which exerts a constant and uniform downward pressure upon the material as it is wound upon the mandrel and along a single line of contact.

12. In a machine for manufacturing tubes from sheet material, the combination with a mandrel, a hollow mandrel holder having a plurality of longitudinal angular recesses and internal heating means, of means for feeding sheet material to said mandrel to be wound thereon and a pressure device having a longitudinal rib provided with a beveled outer edge to engage the material on the mandrel as the mandrel is rotated.

13. In a machine for manufacturing tubes, the combination with a mandrel holder, a frame having a guide plate adjacent to said holder, of means for heating said mandrel holder and said guide plate, a mandrel supported by said holder adjacent to one edge of said guide plate,

means for feeding sheet material to said mandrel and a pressure device that rests upon the material as it is wound upon the mandrel.

14. The combination with a hollow mandrel holder having a plurality of exterior longitudinal recesses of angular cross section and having lateral passages between the interior and some of said recesses, of a gas burner in the interior of said mandrel holder, the supporting frame of said holder having a guide plate adjacent to the holder and heated by the gas burner therein, a mandrel located in the uppermost recess in the holder, means for feeding sheet fabric to said mandrel and a pressure device that rests upon the material as it is wound upon the mandrel.

15. In a machine for manufacturing tubes, the combination with a longitudinally recessed mandrel holder and a frame in which said holder is supported, of a mandrel freely supported in the holder recess, means for feeding sheet fabric to said mandrel, a pressure device normally resting freely upon the material as it is wound upon the mandrel and means for raising the pressure device when it is desired to remove the mandrel and a tube formed thereon, said means comprising a lost motion spring connection.

16. In a machine for manufacturing tubes, the combination with a cylindrical mandrel, a mandrel holder having a longitudinal angular recess to receive said mandrel, and a frame having a guide plate adjacent to said holder, of means for heating the mandrel holder and guide plate, means for feeding the sheet material over said guide plate to said mandrel, and a pressure device the weight of which is supported by said mandrel and the material wound thereon.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMIL HAEFFEL.

Witnesses:

GEO. GIFFORD,
ALBERT GRABER.

LEO H. BAEKELAND, OF YONKERS, NEW YORK.

METHOD OF MOLDING ARTICLES.

330,946.

Specification of Letters Patent.

Patented Nov. 16, 1909.

By Drawing.

Application filed January 28, 1908. Serial No. 474,880.

To all whom it may concern:

Be it known that I, LEO H. BAEKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Methods of Molding Articles, of which the following is a specification.

In my prior U. S. applications, Ser. Nos. 383,684, filed July 13, 1907, 397,560, filed October 15, 1907, and 405,021, filed December 4, 1907, I have described several methods of obtaining infusible and insoluble condensation products of phenols and formaldehyde.

The present invention relates to a simple method for the production of molded articles consisting wholly or in part of this product.

If a mixture of phenol or its homologues and formaldehyde or polymers be heated, alone or in presence of catalytic or condensing agents, the formaldehyde and the phenol being present in about molecular proportions, or better, approximately equal volumes of commercial phenol or cresol and commercial formaldehyde, these bodies react upon each other and yield a product consisting of two liquids which will separate or stratify on standing. The supernatant liquid is an aqueous solution which contains the water resulting from the reaction or added with the reagents, whereas the heavier liquid is oily or viscous in character and contains the initial products of chemical condensation. The liquids are readily separated, and the aqueous solution may be rejected, or the water may be eliminated by evaporation. The oily or viscous liquid obtained as above described is found to be soluble in or miscible with alcohol, acetone, phenol, and other solvents, but is only partially and imperfectly soluble in benzol. This product may assume a pasty or semi-solid state when cooled, or may even assume a solid or brittle state, but is again liquefied when heated, and this alternate solidification and liquefaction may be repeated so long as the product does not become transformed into the intermediate or into the final condensation products hereinafter described. This product will be hereinafter referred to as the "initial condensation product."

If the initial condensation product be heated in an open vessel at temperatures above 100° C., the mass will foam, emit

vapors, and yield a hard, irregular and porous body, infusible by further heating and insoluble in alcohol, acetone and phenol. In order to avoid the production of a porous mass it has been proposed to harden the initial condensation product at temperatures below 100°, but such hardening is extremely slow and applicable only to relatively thin layers of material. In closed vessels or molds in which pressure may be used to counteract the tendency of the mass to liberate gases or vapors, as described in my application above referred to, the hardening may be accomplished much more quickly and is more complete, the final product being homogeneous or free from all porosity, insoluble in alcohol, acetone, benzol, phenol or glycerin, or any other known solvent, and less elastic than hard rubber but much harder and considerably more resistant to heat, infusible at all temperatures. The product thus obtained is hereinafter referred to as the "final condensation product."

Under proper conditions there may be produced a condensation product which is intermediate in character between the initial and final products above described, and which is hereinafter referred to as the "intermediate condensation product." This intermediate product is solid at all temperatures, more or less hard when cold, but elastic when slightly heated, and is capable at normal or higher temperatures of yielding to pressure but will resume its original shape if pressure be discontinued; further application of heat will soften it to a considerable extent but will not convert it into a liquid. The product is insoluble in alcohol, glycerin, formalin, or a mixture of the two latter compounds, but swells in phenol and in acetone without complete solution. For convenience I will hereinafter refer to both the initial and intermediate condensation products as "partial reaction products," in contradistinction to the insoluble and infusible mass which constitutes the final condensation product.

For the purposes of the present invention I first obtain either of the partial reaction products, that is to say the initial condensation product or the intermediate condensation product in solid form; this result is readily attained by a sufficiently prolonged heating or by adding the proper proportion of a suitable condensing agent, preferably a base as described in my prior application

Ser. No. 397,560. When this point is reached I reduce the material to powder by crushing or grinding. This powder is then introduced into suitable molds and molded in a hydraulic press. Molding is facilitated by applying heat, and it is very advantageous to use temperatures above 100° C., in fact considerably higher temperatures, approaching or exceeding 200° C., give improved results. The use of these high temperatures allows the rapid and complete formation of the final condensation product, which is insoluble and infusible and does not soften or softens only very slightly under application of heat. Or a lower temperature or shorter time of molding may be used, the molded objects being then taken from the mold and transferred to a vessel where they can be heated further under suitable pressure, this procedure having the advantage of a less prolonged use of the mold.

Instead of using the material alone it is often desirable to incorporate with it so-called fillers, as for example inorganic or organic fibrous or cellular materials such as asbestos or wood pulp or other suitable substances which may impart a special color or special properties to the product, or which may cheapen the cost of production or facilitate the act of molding.

The fillers or additional incorporated substances may be added directly to the phenol or the formaldehyde or to any partial reaction product derived from them, and the chemical reaction carried on to such point that the mass has become sufficiently solid to permit subdivision by pulverizing or grinding, care being taken to avoid carrying the reaction to the point where the phenol and formaldehyde are transformed into the final insoluble and infusible condensation product.

The addition of suitable condensing agents, and especially the addition of bases as described in my prior application Ser. No. 397,560, enables me to reach the desired stage of the reaction quickly and surely. After the mass has reached the proper stage it is ground or pulverized, after which it is molded in the hydraulic press as above described.

Molded articles produced by any of the methods above described may be afterward coated by dipping or varnishing with a thin layer of condensation product, which is later transformed into the final condensation product by any of the methods described in my prior applications. This treatment permits the use of compounds containing much filling material and which on this account would otherwise be undesirably porous; the treatment also imparts a gloss to the molded articles. The same result in surfacing the articles can be attained by dusting or coating the walls of

the mold with the unmixed powdered partial reaction product or a mixture very rich in the latter product, or by first coating the mold in this manner and afterward with the same product mixed with an appropriate amount of filler, then pressing and removing as usual.

I am fully aware that ground mixtures containing resinous materials have been heretofore used in molding objects. In the present case, however, the problem is entirely novel, because the final condensation product which enters into the constitution of the article is incapable of being welded by any known method to a compact, homogeneous and strong mass. Under the circumstances, it is necessary to bring the initial or the intermediate product of condensation into such a physical state that it can be subdivided and practically employed for rapid and effective mixing and molding; and it is further necessary that during the act of molding or heating, the further chemical reaction should occur which transforms the partial reaction product into a final condensation product of maximum toughness, hardness, and physical and chemical inertness. It is necessary to deal not merely with a physical treatment which shapes the compressed body, but with a chemical section which either completes the process of condensation or starts a phenomenon of polymerization which brings about the desired result. To mold in the hydraulic press any of the viscous, pasty or liquid mixtures above described involves considerable trouble and expenditure of time, whereas by means of the method herein described I am able to accomplish the molding in from five to ten minutes; or if the objects be small and the temperature sufficiently high the molding may be completed in two minutes or even less, thus securing great industrial advantages.

By the word "phenol" as used in the claims I intend to include as equivalents the homologues of phenol; and by the word "formaldehyde", I include the polymers of formaldehyde.

I claim:

1. The method of molding articles which consists in comminuting a partial reaction product of phenol and formaldehyde, molding the mass under pressure, and transforming the same into an insoluble and infusible condensation product.

2. The method of molding articles which consists in comminuting a partial reaction product of phenol and formaldehyde, molding the mass under pressure, and transforming the same in the mold into an insoluble and infusible condensation product.

3. The method of molding articles, which consists in preparing a comminuted mixture of a partial reaction product of phenol

and formaldehyde and a filling material, molding said mixture, and transforming the partial reaction product into an insoluble and infusible final condensation product.

4. The method of molding articles, which consists in preparing a comminuted mixture of a partial reaction product of phenol and formaldehyde and a filling material, molding said mixture, transforming the partial reaction product into an insoluble and in-

fusible final condensation product, and providing the molded article with a surface layer containing a larger proportion of said final condensation product.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

H. S. TARBELL,

MARY I. SHORT.

UNITED STATES PATENT OFFICE

LEO H. BAKKELAND, OF YONKERS, NEW YORK.

PACKING MATERIAL.

941,805.

Specification of Letters Patent.

Patented Nov. 30, 1909.

No Drawing.

Application filed February 1, 1909. Serial No. 475,882.

To all whom it may concern:

Be it known that I, LEO H. BAKKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Packing Material, of which the following is a specification.

This invention relates to packing materials, and comprises a packing material, packing, gasket, washer or the like containing as an essential component an insoluble and infusible condensation product of phenol and formaldehyde of the character described in my copending applications, Serial Nos. 383,684, filed July 13, 1907, 397,560, filed October 15, 1907, and 403,021, filed December 4, 1907, or a partial reaction product of phenol and formaldehyde capable of transformation by heat into the said insoluble and infusible product. This material is highly resistant to heat and chemical action and I have found gaskets or similar forms of packing material containing the same to be capable of withstanding hot steam, hot gases, solvents and chemical solutions, which attack all other forms of packing material known to me.

The packing preferably comprises a fibrous or filamentary material of inorganic or organic origin, as for example asbestos, asbestos paper or felt, woven asbestos, ordinary paper, woven tissues or cloth, woven metal wire or similar substances, serving as a body or skeleton to be impregnated with the insoluble and infusible condensation product above referred to. I may also incorporate with the mass graphite, talc, soapstone or like materials, serving to harden it and to prevent sticking; or the packing may have an external coating of such materials, alone or in conjunction with the said condensation product.

Various methods may be employed in preparing the packing material. For example I may impregnate the fibrous or filamentary body with a mixture of approximately equal volumes of commercial phenol or other phenolic body and a commercial 40% solution of formaldehyde, or the polymers of formaldehyde, catalytic or condensing agents, preferably bases, being added if desired. The composition is then heated to effect the chemical transformation of the mass into the insoluble and infusible condensation

product referred to. During this heating, or in the earlier stages thereof, the composition is preferably kept under sufficient pressure to prevent the formation of a porous product, as fully described in my copending applications above mentioned.

As fully explained in the said copending applications, there exists certain partial reaction products of phenol and formaldehyde which may be either liquid or solid, and which present a wide variation with respect to solubility, these partial reaction products having however in common the property of being transformed under the influence of heat into the insoluble and infusible condensation product to which I have referred above. These partial reaction products, whether liquid or solid, may be combined or mixed with the fibrous or filamentary body and thereafter transformed into the final condensation product by subjecting them to heat under suitable conditions. Whether the body be impregnated or mixed with the original phenol and formaldehyde or with a partial reaction product thereof, the reaction which effects the transformation into the final condensation product may be deferred until the packing is put into use, the heat to which it is subjected under conditions of use being availed of for effecting this transformation.

Another simple method of applying the invention is to coat or impregnate asbestos felt, paper or woven cloth with an alcoholic solution of a soluble partial reaction product of phenol and formaldehyde, and to permit the solvent to evaporate. The resulting composition may be kept ready for use either in sheets or in cut sizes, and may undergo the final transformation in use in case the conditions of use are suitable for effecting such transformation, that is to say in case the conditions are such that the material will be subjected to the joint action of heat and pressure.

The packing may be in the form of flat sheets or shapes as above described, or in the form of ropes, yarns, coils or braids of suitable shape or section rendering it available for use in stuffing boxes, pistons, etc. Or the composition may take the form of loose fiber, properly mixed or impregnated with a partial or final reaction product. To any of these forms graphite, talc, soapstone or like material or lubricant adapted to pre-

sticking may be added. I may also incorporate with any of the above described forms of packing material sheets, woven fabrics, wires or braids of metal, or powdered or granular metals.

The word "phenol" as employed in the claims is intended to include such phenolic bodies as are the equivalents of phenol for the purposes of this invention; and the word "formaldehyde" is intended to include the polymers of formaldehyde.

I claim:

1. A packing material containing an insoluble and infusible condensation product of phenol and formaldehyde.

2. A packing material comprising a body

coated or impregnated with phenol and formaldehyde or a reaction product thereof.

3. A packing material comprising a fibrous body coated or impregnated with an insoluble and infusible condensation product of phenol and formaldehyde.

4. A packing material comprising a body coated or impregnated with phenol and formaldehyde or a reaction product thereof, and a lubricant.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

H. S. TARBELL,

MARY L. SHORT.

UNITED STATES PATENT OFFICE.

LEO H. BAEKELAND, OF YONKERS, NEW YORK.

METHOD OF MAKING INSOLUBLE PRODUCTS OF PHENOL AND FORMALDEHYDE

942,699.

Specification of Letters Patent.

Patented Dec. 7, 1909

No Drawing.

application filed July 13, 1907. Serial No. 383,684.

To all whom it may concern:

Be it known that I, LEO H. BAEKELAND, a citizen of the United States, residing at Snug Rock, Harmony Park, Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Methods of Making Insoluble Condensation Products of Phenols and Formaldehyde, of which the following is a specification.

In my prior application Ser. No. 358,156, filed February 18, 1907, I have described and claimed a method of indurating fibrous or cellular materials which consists in impregnating or mixing them with a phenolic body and formaldehyde, and causing the same to react within the body of the material to yield an insoluble indurating condensation product, the reaction being accelerated if desired by the use of heat or condensing agents. In the course of this reaction considerable quantities of water are produced, and a drying operation is resorted to to expel it.

The present invention relates to the production of hard, insoluble and infusible condensation products of phenols and formaldehyde.

In practicing the invention I react upon a phenolic body with formaldehyde to obtain a reaction product which is capable of transformation by heat into an insoluble and infusible body, and then convert this reaction product, either alone or compounded with a suitable filling material, into such insoluble and infusible body by the combined action of heat and pressure. Preferably the water produced during the reaction or added with the reacting bodies is separated before hardening the reaction product. By proceeding in this manner a more complete control of the reaction is secured and other important advantages are attained as hereinafter set forth.

If a mixture of phenol or its homologues and formaldehyde or its polymers be heated, alone or in presence of catalytic or condensing agents, the formaldehyde being present in about the molecular proportion required for the reaction or in excess thereof, that is to say, approximately equal volumes of commercial phenol or cresylic acid and commercial formaldehyde, these bodies react upon each other and yield a product consisting of two liquids which will sep-

arate or stratify on standing. The lighter or supernatant liquid is an aqueous solution, which contains the water resulting from the reaction or added with the reagents, whereas the heavier liquid is oily or viscous in character and contains the first products of chemical condensation or dehydration. The liquids are readily separated, and the aqueous solution may be rejected or the water may be eliminated by evaporation. The oily liquid obtained as above described is found to be soluble in or miscible with alcohol, acetone, phenol and similar solvents or mixtures of the same. This oily liquid may be further submitted to heat on a water- or steam-bath so as to thicken it slightly and to drive off any water which might still be mixed with it. If the reaction be permitted to proceed further the condensation product may acquire a more viscous character, becoming gelatinous, or semi-plastic in consistence. This modification of the product is insoluble or incompletely soluble in alcohol but soluble or partially soluble in acetone or in a mixture of acetone and alcohol. The condensation product having either the oily or semi-plastic character may be subjected to further treatment as hereinafter described. By heating the said condensation product it is found to be transformed into a hard body, unaffected by moisture, insoluble in alcohol and acetone, infusible, and resistant to acids, alkalis and almost all ordinary reagents. This product is found to be suitable for many purposes, and may be employed either alone or in admixture with other solid, semi-liquid or liquid materials, as for instance asbestos fiber, wood fiber, other fibrous or cellular materials, rubber, casein, lamp black, mica, mineral powders as zinc oxid, barium sulfate, etc., pigments, dyes, nitrocellulose, abrasive materials, lime, sulfate of calcium, graphite, cement, powdered horn or bone, pumice stone, talcum, starch, colophonium, resins or gums, slate dust, etc., in accordance with the particular uses for which it is intended, and in much the same manner as india rubber is compounded with the above-named and other materials to yield various valuable products. In compounding the condensation or dehydration product in this manner the desired materials are mixed with the same before submitting it to the final hardening operation below described.

In order to convert the condensation or dehydration product into the final product above-described I may subject it to a temperature which will depend upon the specific results sought. If it be desired to mold the material directly the condensation product is poured or pressed into a suitable mold and is submitted therein while maintaining appropriate pressure to a suitable temperature, say about 110-140° C.; under these conditions there is obtained in from one to two hours or less a hard, compact, perfectly homogeneous mass similar in its properties to hard rubber or to ivory, insoluble in alcohol, acetone, and resistant to heat or infusible, and resistant to moisture and most chemical reagents as above described. In case the product be first mixed with asbestos fiber, rubber, powdered substances or other materials as above described, and heat be thereafter applied a compound is obtained in the form of hard masses containing the insoluble condensation product described. Such masses may be produced directly in any desired form by the use of a suitable mold, or they may be produced in a block or irregular mass which may be cut, sawed, turned or otherwise manipulated to any suitable form or size.

Small proportions of solvents may be added to the initial condensation product in order to facilitate the compounding or mixing of the same, the resulting mixture being then submitted to the final baking or hardening process as described.

While I have indicated above a practical hardening temperature of 110-140° C. it should be understood that higher temperatures may be employed, in which case the time required for the hardening process is considerably reduced; the hardening may also be conducted at 100° C. and even at lower temperatures, more particularly for impregnating fibrous or cellular materials, but in this case the hardening is found to be very slow and some days may be required for its completion. The hardening may be greatly accelerated by adding small proportions of catalytic agents, or so-called condensing agents, as for instance zinc chlorid, other metallic chlorides, acids or salts. In case such condensing agents are added the hardening occurs rapidly at relatively low temperatures.

The mode of application or compounding of the condensation product will of course depend upon the results sought. For treating or indurating wood, the surface only may be treated, or it may be treated throughout its mass substantially as described in my copending application above referred to; the treated material is thereafter submitted to heat, some condensing agent being added if desired. For facilitating the penetration of wood or the like the

condensation product may be slightly heated to render it more mobile, or small proportions of suitable solvents may be added.

The final heating or baking by which the condensation product, alone or compounded, 70 is converted into an insoluble body should be effected in a closed vessel in case the temperature exceed 90°-100° C.; without this precaution vapors of formaldehyde and the like escape causing foam and air bubbles; 75 furthermore the loss of the reagents and the disturbance of the proportions between them prevents obtaining a product of maximum hardness and uniform texture. In a closed vessel under pressure the operation proceeds 80 with precision, and a uniform result may be always obtained.

Instead of ordinary phenol I may use cresol and its homologues, or other phenolic bodies. If desired I may employ in place of 85 commercial formaldehyde a solution of anhydrous formaldehyde in phenol; or the polymer of formaldehyde which on heating splits up into anhydrous formaldehyde, may be used. 90

The initial oily, viscous or semi-plastic condensation product may be obtained in various ways, as for instance by digesting a suitable mixture of phenol and formaldehyde in an autoclave, or merely by boiling 95 a mixture of the same in an open vessel provided with a return condenser in order to avoid loss and variation of proportions. A very small proportion of mineral or organic acid, or of zinc chlorid, calcium chlorid, or other salt or agent favoring condensation may be added to the mixture, the proportion being in all cases so small as to avoid such energetic reaction as will not permit the intermediate oily, viscous or semi-plastic con- 105 densation product to be obtained. Or I may add a solid salt as for instance calcium chlorid to the mixture of phenol and formaldehyde in which case the calcium chlorid immediately absorbs water and forms two distinct layers, the lower one being formed by a very dense aqueous solution of calcium chlorid, the upper one by the dehydrated ma- 110 ture.

I claim:

1. The method of producing a hard, compact, insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting upon a phenolic body with formaldehyde, and then converting the product into a hard, insoluble and infusible body by the combined action of heat and pressure. 120

2. The method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, producing thereby a reaction product capable of transformation by heat into an insoluble and infusible body, form- 125 130

ing the article from said reaction product, and rendering the article hard, insoluble and infusible by application of heat and pressure.

3. The method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, producing thereby a reaction product capable of transformation by heat into an insoluble and infusible body, separating water from the resulting product, forming the article from said reaction product, and rendering the article hard, insoluble and infusible by application of heat and pressure.

4. The method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, producing thereby a reaction

product capable of transformation by heat into an insoluble and infusible body, forming the article from said reaction product compounded with a filling material, and rendering the article hard, insoluble and infusible by application of heat and pressure.

5. In a method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, the step which consists in causing the water to separate from the mixture of a phenolic body and an aqueous solution of formaldehyde by adding to said mixture a metallic salt soluble in water and adapted to cause such separation.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

FRED R. CAREY,
HARRY S. TARBELL.

UNITED STATES PATENT OFFICE.

LEO H. BAEKELAND, OF YONKERS, NEW YORK.

CONDENSATION PRODUCT AND METHOD OF MAKING SAME.

942,909.

Specification of Letters Patent.

Patented Dec. 7, 1909.

No Drawing. Application filed October 15, 1907, Serial No. 397,460. Renewed September 17, 1908. Serial No. 515,322.

To all whom it may concern:

Be it known that I, LEO H. BAEKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Condensation Products and Method of Making Same, of which the following is a specification.

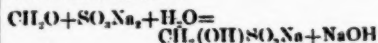
This invention relates to an improved method of reacting with formaldehyde upon phenol or a phenolic body, and the improved product resulting from such reaction.

The condensation products resulting from the chemical action of aldehydes on phenols have received by further treatment some industrial applications in the manufacture of varnishes, resinous products and plastic compounds. In some cases such condensation products have been prepared by simple boiling or heating of phenol and formaldehyde without the addition of condensing agents; but such treatment does not in all cases yield the desired result, and at best the reaction is very slow, requiring about eight hours boiling with ordinary commercial phenol and formaldehyde. With pure crystallized phenol the reaction does not occur even after forty-eight hours constant boiling. It has also been proposed to use acids or salts as condensing agents, but the employment of these results in a stormy reaction, often difficult to control, and yields products containing undesirable impurities which it is difficult or impracticable to eliminate, these impurities having the effect of causing the resulting mass to darken with age or in presence of alkalies.

I have discovered that the addition in proper proportions of an organic or inorganic base to a mixture of phenol and formaldehyde, or to either component of the mixture, facilitates the reaction and yields products which are commercially far superior to those obtained by simple heating or by the use of acids or salts as condensing agents. The proportion of phenol to formaldehyde may be considerably varied, the formaldehyde being present in about the molecular proportion required for the reaction or in excess thereof. The base may be added at any phase of the process, either at the start or during the heating of the mixture, or in successive portions as the heating proceeds.

According to my invention the alkalies or bases are used in such relatively small proportions that their presence does not interfere with the desirable qualities of the products, rendering it unnecessary to eliminate them by washing or neutralizing. In fact in most cases the small amount of base persists in the final products and confers upon them new and desirable properties.

By reason of their comparative cheapness it is preferred to employ as a condensing agent ammonia, anhydrous or aqueous, ammonium carbonate, caustic alkalies or their carbonates, anilin or pyridin, but other bases as for instance the hydrates of barium, strontium, or calcium may be used. Amins and amids, and in general all derivatives of the type NH , which possess basic properties are found to act in the same manner. Similarly all basic salts, or salts which by secondary reaction engender bases, as for instance alkali sulfids, acetates and cyanids, sodium triphosphate, borax, soaps, etc., may be used; also alkali sulfites may serve, for the reason that when boiled with formaldehyde they liberate alkali in accordance with the well known reaction:



The bases above referred to, and others having the requisite basic properties, are employed in variable proportions, according to their character and also according to the result desired. Additions of ammonia or caustic soda in so small a proportion as one-half per cent. of the weight of phenol used show a decided influence, but in most cases it is desirable to use somewhat larger proportions, rarely attaining however 10% by weight of the phenol or phenolic body. The proportion of bases used as condensing agents has a preponderant influence on the nature of the ultimate products. For instance, if a large amount of ammonia be used, hexamethylenetetramin is formed, which is a crystalline body of definite chemical properties. (See Wohl, *Ber.*, 19, 1903; Tollens, *Ber.*, 17, 653. See also Monchats and Tollens *Ann. der Chemie*, 373, 380.) Likewise, if large amounts of caustic soda be used there are obtained alkaline derivatives of phenol-alcohol. (See Lederer, *Journal Praktische Chemie* (3), Vol. 50, page 294,

and Manassé U. S. P. 526, 786, 1894). It is therefore essential that the proportion of base should not exceed certain definite limits, and the maximum permissible proportion has been found to be less than one-fifth of the equimolecular proportion of phenolic body present. If larger proportions of base be used there are formed in the mass such amounts of disturbing bodies as serve to render the product technically inferior or worthless for the purposes of this invention.

It should be understood that in the case of such basic compounds as alkali sulfides, cyanids, sodium triphosphate, or those that yield bases by reaction as for instance the alkali sulfites, the proportion of salt to be used should be calculated in proportion to the quantity of base liberated.

In carrying the process into effect the reacting bodies are brought together in a suitable vessel, the most available bodies being ordinary phenol, pure or commercial, (the latter containing the homologues of phenol) and formaldehyde. If the base be strong or the amount of the same relatively large the reaction may begin at ordinary temperatures, and will be usually indicated by a separation of the liquid mixture into two superposed layers, viz., an aqueous layer consisting of separated water containing some water-soluble materials, and an oily layer containing the initial products of dehydration. The reaction is rendered more complete by heat, and this may be applied in a closed vessel, or in a vessel provided with a return condenser, in such manner as to avoid any loss of volatile materials.

The progress of the reaction may be followed by noting the increasing viscosity of the oily liquid. The heating is interrupted after a suitable consistence for the purposes in view has been attained, this condition being often reached in the course of a very few minutes. Continuation of the reaction yields a more or less viscous, elastic or semi-solid product, which for certain purposes may be preferred to the oily liquid above referred to. The oily liquid is found to be soluble in alcohol, acetone and similar solvents, and in conjunction with these forms varnishes of excellent quality.

Application of heat under proper conditions to the dry varnish renders it insoluble in all ordinary solvents, and substantially inert to acid and alkaline reagents. Instead of dissolving the oily liquid directly, it may first be concentrated further; such treatment is found to improve somewhat the qualities of the product for general purposes. It is not necessary to withdraw the oily liquid from the supernatant aqueous liquor, but the whole may be submitted to further evaporation, even to the point of becoming elastic, semi-solid or even solid at normal

temperatures, the mass being still fusible and soluble in alcohol or in a mixture of alcohol and acetone.

The mass produced as above described may be hardened and rendered insoluble by the application of heat at temperatures below the boiling point of water, but it will require heating for a period ranging from several days to several weeks before the final product is sufficiently hard. However by submitting the mass under pressure in a closed vessel or mold to a higher temperature, say 120°-200° C., or even higher, as described in my co-pending application, Ser. No. 383,684, filed July 13, 1907, a compact mass of excellent properties may be quickly obtained; or a moderate temperature may be applied until the mass has become superficially hardened, and this may be followed by the application of a relatively high degree of heat to complete the hardening process.

The above treatment yields a mass which is insoluble in alcohol and all ordinary solvents, and which is unaffected or but little affected by acids, alkalies, and all ordinary chemical reagents. The mass is resistant to heat, withstanding temperatures as high as 300° C., and is infusible at all temperatures. It differs mainly from the product prepared in accordance with my co-pending application above referred to in that the basic condensing agent used persists in the final product as well as in the intermediate stages leading thereto.

A wide variety of compositions may be prepared by incorporating solid, semi-solid, or liquid materials of the most varied nature, the addition of such substances being made at any desired stage of the process, either before the reagents are mixed, or to the mass resulting from their reaction, or at any time before or during the final hardening. Any desired color may be imparted to the product by the addition of suitable dyes or pigments.

As examples of desirable proportions of the ingredients the following may be mentioned:

Example 1: Phenol 50 parts by weight, commercial formaldehyde 30 to 70 parts by weight, aqueous ammonia 1 to 10 parts by weight.

Example 2: Phenol 50 parts by weight, commercial formaldehyde 30 to 70 parts by weight, anilin 1 to 7 parts by weight.

Example 3: Phenol 50 parts by weight, commercial formaldehyde 30 to 70 parts by weight, commercial sodium or potassium hydroxid or carbonat. 0.5 to 6 parts by weight.

I am aware that it has been proposed to dissolve phenol in substantially molecular proportions of caustic alkali with formation of a phenolate, then to react upon the pheno-

late with formaldehyde, afterward neutralizing the alkali by means of acid, the product in this case being a solid soluble in alcohol and in caustic potash. (See French Patent No. 361,539 to De Laire.) My method differs from the above in that it does not contemplate the employment of alkali in the large proportion described, rendering necessary its subsequent neutralization; and my product differs from that described above in that instead of being a solid soluble in alcohol it is a mass, capable of being molded and of forming homogeneous mixtures, and yielding under the influences of heat or of heat and pressure a solid mass insoluble in alcohol and in all other ordinary solvents and substantially unaffected by acid or alkaline reagents.

I claim:

1. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used.

2. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, and separating water from the resulting product.

3. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, separating water from the resulting product, and then hardening the same.

4. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, separating water from the resulting product, and then hardening the same by application of heat and pressure.

5. The method which consists in reacting

on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, compounding the resulting body with a suitable material and then hardening the composition.

6. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, compounding the resulting body with a suitable material and then hardening the composition by application of heat and pressure.

7. The herein described condensation product resulting from the reacting of a phenolic body and formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, said product varying in its physical characteristics in accordance with the reacting conditions, and characterized by the presence of the free or combined base in quantities not exceeding the above proportions, by its insolubility in water, its solubility in alcohol or acetone, and by its capacity for transformation under heat and pressure into a solid body insoluble in alcohol, acetone or like solvents, or in acid or alkaline reagents.

8. The herein described condensation product resulting from the reaction of a phenolic body and formaldehyde in presence of a basic condensing agent, said condensation product characterized by its hardness, its insolubility in water and all known solvents, by its infusibility or resistance to heat, and by the presence therein of a proportion of free or combined base not exceeding one-fifth of the equimolecular proportion of phenolic body employed.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

FRED R. CAREY,
H. S. TARBELL.

UNITED STATES PATENT OFFICE.

LEO H. BAEKELAND, OF YONKERS, NEW YORK.

METHOD OF INDURATING FIBROUS AND CELLULAR MATERIAL.

949,671.

Specification of Letters Patent.

Patented Feb. 15, 1910.

No Drawing.

Application filed February 18, 1907. Serial No. 358,156.

To all whom it may concern:

Be it known that I, LEO H. BAEKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Methods of Indurating Fibrous and Cellular Materials, of which the following is a specification.

The object of this invention is to provide a method of indurating fibrous and cellular materials such as wood, wood-pulp, cotton, asbestos or the like, and imparting to the same additional strength and resistance to physical and chemical agents.

According to my invention there is produced synthetically within a fibrous body, and around the fibers or bundles of fibers constituting the same, a hard condensation product of phenols and formaldehyde. By the treatment of wood according to my method a soft or inferior wood can be transformed, either superficially or throughout its mass, into a material similar in character to the best grades of hard wood, and resembling mahogany, ebony, and the like.

The invention is based on the known fact that phenols and formaldehyde react under suitable conditions to yield solid condensation products. For instance ordinary phenol is capable of reacting with formaldehyde to produce a condensation product. This reaction is accelerated by the application of heat and by the presence of so-called condensing agents, as for instance mineral or organic acids, such as hydrochloric or tartaric acids, salts, as for example zinc chlorids and the like. In this particular instance an alcohol-soluble product may be obtained if the formaldehyde be not used in excess of the molecular proportion; if however formaldehyde be used in larger proportions a very hard and insoluble condensation product results. This latter product, in the absence of special coloring agents and as prepared from commercial materials, is usually yellow or brown in color, insoluble in all known solvents and inert in most chemical reagents, both acid and alkaline. It is infusible, but chars at temperatures considerably exceeding 300° C. Chemically it may be regarded in its simplest form as a polymerized oxybenzyl-methylen-glycol-anhydrid or its homologues. Either of these materials is suitable for the purposes of my invention.

In order to carry my method into effect I impregnate the wood or other fibrous material with the reacting bodies before the reaction has occurred, and I so arrange the conditions that the reaction yielding the condensation product occurs within the fibrous material. This can be accomplished in several ways. For instance a mixture of phenol or phenols with formaldehyde, with or without condensing agents, may be introduced into the fibrous material, and the reaction permitted to occur therein. If desired the reaction may be accelerated by the application of heat. The mixture may be applied to the surface of the wood or other fibrous material, or the material may be immersed in the mixture, or the known means for increasing penetration, as for instance vacuum and pressure, may be resorted to.

Instead of mixing the condensing agent with the reacting bodies or a mixture of them, the condensing agent may be applied afterward. For instance wood may be dipped in or painted with a mixture of phenol and formaldehyde and afterward painted with or dipped in an acid solution, or a solution of zinc chlorid or the like, which immediately starts the reaction. In cases in which a condensing agent is used it may be washed out after the reaction is complete, or it may be rendered harmless by the use of neutralizing agents. If for instance hydrochloric acid is employed as a condensing agent the impregnated material may be afterward soaked in water or in a slightly alkaline solution until the acid is removed or neutralized.

Instead of impregnating the wood or fibrous or cellular material with a mixture of reacting bodies, these may be introduced successively. For example the wood may be first impregnated with phenol, and thereafter subjected to the action of formaldehyde either as a gas or solution, the action being hastened if desired by the use of heat or condensing agents or by the simultaneous action of heat and condensing agents.

Heat may be applied in any of the usual ways, as for instance by the use of hot air, hot water or steam, each of these methods having its advantages or disadvantages in particular cases.

In case it is desired to indurate loose fibrous materials, as for instance wood-pulp, cotton, asbestos or the like, it may be neces-

may or desirable to subject the impregnated mass to pressure while the reaction is proceeding, in order to better insure its hardening or to determine a desired shape of the completed body. Special molds can be used for this purpose to obtain specified shapes, and the operation may be similar in some respects to the vulcanization of rubber products. The pressure may vary according to whether it is used merely for the purpose of preventing chemical dissociation or volatilization of the formaldehyde, or for giving a particular shape or configuration to the impregnated product. In the first case the pressure may be very slight, provided the heating of the impregnated product be started at sufficiently low temperatures. In some cases a pressure not exceeding fifteen pounds per square inch may be sufficient to counteract dissociation or volatilization, although ordinarily it is preferred to use a pressure of 50 to 100 pounds or more per square inch. If however the pressure be used for imparting a shape to the impregnated product, it becomes advisable to use much higher pressures, as those obtainable by the use of the lever press, screw press, hydraulic press or similar devices.

The method may be modified in various ways; for instance coloring agents or pigments may be introduced with the reacting bodies, before or after their application. Coloring agents may be mixed with the reacting bodies, or colors may be developed in or on the impregnated material by the action of appropriate agents. For instance oxidizing agents or alkaline compounds are found to darken the color of the impregnated wood or fiber. Instead of impregnating the whole mass of wood or fibrous material, the method may be so modified as to limit the impregnation to the outer portions, thus economizing the reagents and preserving the original character of the interior of the body, and yet hardening the outside to a sufficient extent for certain purposes. In case of white wood for instance such superficial impregnation will not only harden the wood but considerably increase its strength. The wood may be dried or otherwise treated before being subjected to the inducing treatment; and after such treatment it should be further dried to expel the water which was formed during the reaction or which may have been introduced with the formaldehyde solution.

Wood or fibrous material treated in accordance with my method is not only improved in its physical character, but it is found to be more resistant to chemical action and atmospheric agents: its density is increased, and its electrical resistance is likewise considerably increased.

The results obtained by the method described are far superior to those secured by

immersing the material in a solution of a gum or resin with subsequent drying. A mixture of phenol and formaldehyde possesses extraordinary penetrating qualities, far exceeding those of resinous solutions. No expense is involved for solvents. Furthermore as above stated it is possible to produce within the wood or like material condensation products which are totally insoluble and difficultly fusible, and which for these reasons could not be introduced into the body of the fibrous material by any known method.

Although the method may be carried out in the several modifications described above I will give a specific example: Wood, for instance poplar, is impregnated with a liquid mixture of about equal volumes of ordinary commercial carbolic acid or cresol and commercial formaldehyde. The proportions of the latter may be varied in rather wide ranges; for instance, it may be used in double the amount of the carbolic acid, or be reduced to one-half of the amount of carbolic acid and yet give more or less satisfactory results. When an excess of formaldehyde or carbolic acid is used, this excess will be found in free condition after the reaction is over. In the liquid mixture described above I may dissolve some asphaltum, nigrosin or other suitable coal-tar dyes, so as to produce a darker color; or I may simply add some soluble iron salt, for instance ferric chloride, which not only influences the color but, furthermore, acts as a condensing agent. The impregnated wood is now submitted to slow and progressive heating, preferably in a closed vessel. It is advantageous to start at moderate temperatures, say about 50° C., and then gradually increase to about 135° C. The heating must be continued until the synthesis has proceeded far enough, which can be determined easily by examining the wood from time to time and observing its increasing hardness and the thickening of the fluid. This may take from two hours to several days, according to whether the heat has been applied gradually or rapidly and according to the size of the pieces of wood treated. In the case of large blocks of wood the heat penetrates slowly and consequently the action is proportionately retarded. The same method of procedure is applied to loose fibrous or cellular materials, for instance, sawdust, wood pulp or asbestos, with this difference, however, that during the progressive action of heating the mass may be compacted and agglomerated by submitting the same to pressure in suitable molds. It should be borne in mind that inorganic fibrous materials like asbestos can stand a considerably higher heat in this treatment than wood or other organic fibrous materials. For instance, impregnated asbestos can be heated to as high as

200° C. without danger of destruction. For that reason the heating process can be carried on quicker and more thoroughly. During the act of heating in the air some superficial oxidation takes place which considerably darkens the color of the impregnated objects. This color can still further be developed by dipping the objects in a dilute solution of carbonate of sodium or other alkaline substance, or in oxidizing agents like chromate of potassium, and then afterward drying in air. In the same way a dark red color may be developed by applying lead peroxid.

15 I claim:

1. The method of indurating fibrous and cellular materials, which consists in impregnating the materials with a phenolic body and formaldehyde under conditions capable of producing by synthesis an indurating condensation product, and causing the same to react within the body of the material to yield said indurating condensation product.

2. The method of indurating wood which consists in impregnating the wood with a phenolic body and formaldehyde under conditions capable of producing by synthesis an indurating condensation product, and causing the same to react within the body of the wood to yield said indurating condensation product.

3. The method of indurating fibrous and cellular materials which consists in impregnating the materials with a phenolic body and formaldehyde under conditions capable of producing by synthesis an indurating condensation product, and causing the same to react under pressure within the body of the material to yield said indurating condensation product.

4. The method of indurating fibrous and cellular materials which consists in impreg-

nating the materials with a phenolic body and formaldehyde under conditions capable of producing by synthesis an insoluble indurating condensation product, and causing the same to react within the body of the material to yield said indurating condensation product.

5. The method of indurating wood which consists in impregnating the wood with a phenolic body and formaldehyde under conditions capable of producing by synthesis an insoluble indurating condensation product, and causing the same to react within the body of the wood to yield said indurating condensation product.

6. The method of indurating fibrous and cellular materials which consists in impregnating the materials with a phenolic body and formaldehyde under conditions capable of producing by synthesis an insoluble indurating condensation product, and causing the same to react under pressure within the body of the material to yield said indurating condensation product.

7. The method of forming articles containing condensation products of phenols and formaldehyde, consisting in impregnating porous materials with phenols, subjecting the same to the action of formaldehyde under pressure in a closed receptacle, applying heat, maintaining the pressure of the gas sufficiently to prevent chemical dissociation of the forming condensation product, and continuing the operation until the infusible condensation product of phenols and formaldehyde is produced.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

CHAR. H. POTTER,
E. G. FULLAM.

UNITED STATES PATENT OFFICE.

LEO H. BARKELAND, OF YONKERS, NEW YORK.

VARNISH.

354,666.

Specification of Letters Patent.

Patented Apr. 12, 1910.

No. Drawing. Original application filed October 15, 1907, Serial No. 397,543. Divided and this application filed November 28, 1909. Serial No. 393,378.

To all whom it may concern:

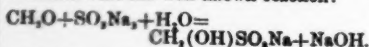
Be it known that I, LEO H. BARKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Varnishes, of which the following is a specification.

Attempts have been made to manufacture varnishes by means of condensation products of phenols and formaldehyde. In some cases phenols and formaldehyde were made to react in presence of acid condensing agents or by alkalies followed by acidification, the result being in each case the production of condensation products which were permanently fusible and soluble. In other terms, a continued application of heat does not transform these resinous products into insoluble, infusible bodies, and the hardness of the layer produced by these varnishes is of rather inferior quality. Furthermore, heating of the varnished articles does not transform the varnish film into a hard, insoluble protective layer. In other cases a varnish was made by simply boiling phenols and formaldehyde without any condensing agents, and a varnish was thus obtained which could ultimately be changed by the application of heat into an infusible, insoluble layer. The present invention differs from the procedures above mentioned in that by the addition to the mixture of phenols and formaldehyde or their reaction products of a relatively small proportion of a base I am able to accelerate to a considerable degree the hardening and insolubilizing action of heat, and at the same time to impart to the varnish or to the coating obtained therefrom better qualities of permanency and quick drying. The addition of this base can be made at any stage of the process. Furthermore, solid, semi-solid or liquid materials of the most varied nature can be added, addition of such substances being made at any desired stage of the process, and desirable colors may be imparted to the product by the addition of suitable dyes or pigments.

In order to carry out my invention I may proceed as follows:—Equal amounts of commercial carboic acid and commercial 40% formaldehyde solution are made to react upon each other in presence of a base. Water is separated and the obtained product afterward dissolved in a suitable amount of

solvent. Instead of commercial Carboic acid I can use pure phenol or any of its homologues or a suitable mixture of these products or any equivalents thereof, which I have designated under the generic term of phenolic body. Instead of formaldehyde I can use the polymers of formaldehyde or in general any substances which engender formaldehyde. The proportion of formaldehyde can be widely varied, and in fact it is still possible to obtain acceptable results if the amount of formaldehyde indicated above is doubled or reduced to one-half. In such instances the final varnish will contain either an excess of formaldehyde or a proportion of free phenolic body.

By reason of their comparative cheapness it is preferred to employ as a condensing agent ammonia, anhydrous or aqueous, ammonium carbonate, caustic alkalies or their carbonates, anilin or pyridin, but other bases as for instance the hydrates of barium, strontium, or calcium may be used. Amins and amids, and in general all derivatives of the type NH, which possess basic properties are found to act in the same manner. Similarly all basic salts, or salts which by secondary reaction engender bases, as for instance alkali sulfids, acetates and cyanids, sodium triphosphate, borax, soaps, etc., may be used; also alkali sulfites may serve, for the reason that when boiled with formaldehyde they liberate alkali in accordance with the well known reaction:



The bases above referred to, and others having the requisite basic properties, are employed in variable proportions, according to their character and also according to the result desired. Additions of ammonia or caustic soda in so small a proportion as one-half per cent. of the weight of phenol used show a decided influence, but in most cases the amount of base in the varnish is somewhat larger but rarely attains 10% by weight of the phenolic body employed.

It should be understood that in the case of such basic compounds as alkali sulfids, cyanids, sodium triphosphate, or those that yield bases by reaction as for instance the alkali sulfites, the proportion of salt to be used should be calculated in proportion to the quantity of base liberated. If the base

be strong or the amount of the same relatively large the reaction may begin at ordinary temperatures, and will usually, but not always, be indicated by a separation of the liquid mixture into two superposed layers, viz., an aqueous layer consisting of separated water containing some water-soluble materials, and an oily layer containing the initial products of dehydration. The reaction is accelerated and rendered more complete by heat.

The progress of the reaction may be followed by noting the increasing viscosity of the oily liquid. The heating is interrupted after a suitable consistence for the purposes in view has been attained, this condition being often reached in the course of a very few minutes. Continuation of the reaction of evaporation yields a more or less viscous, semi-solid or even solid product, which for certain purposes may be preferred to the oily liquid above referred to, being still soluble in alcohol or acetone and similar solvents, and in conjunction with these forming varnishes of excellent quality. Application of heat under proper conditions to the dry varnish renders it insoluble in all ordinary solvents, and substantially inert to acid and alkaline reagents.

When I specify the amount of free base as above I mean to designate the amount of base which actually remains as such in the product or the varnish made from it, it being well understood that if larger amounts

of bases are used the same may be partially neutralized afterward by known methods, as by the judicious addition of an acid, thus reducing the temporarily employed base within the limits described above.

This application is, in so far as it relates to the composition of the varnish, a division of my prior application Ser. No. 397,500, filed October 15, 1907.

I claim:—

1. A varnish containing a volatile organic solvent and a condensation product of a phenolic body and formaldehyde, said condensation product characterized by its capability of transformation under the action of heat into an insoluble and infusible body, and by the presence therein of a base condensing agent.

2. A varnish containing a volatile organic solvent and a condensation product of a phenolic body and formaldehyde, said condensation product characterized by its capability of transformation under the action of heat into an insoluble and infusible body, and by the presence therein of a base condensing agent in proportions not exceeding one-fifth of the equimolecular proportion of phenolic body employed.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

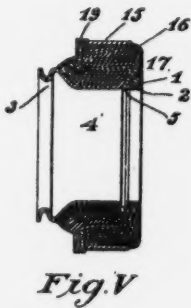
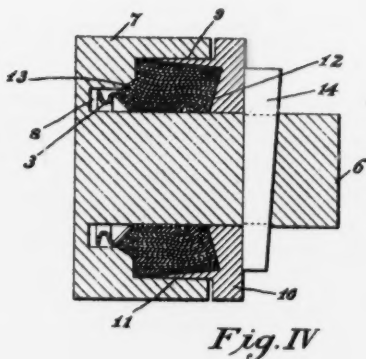
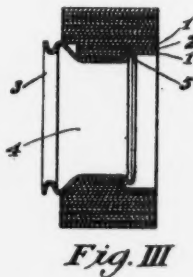
Witnesses:

H. S. TARBELL,
MARY L. SHORT.

J. M. TOWNE.
METHOD OF MANUFACTURING GASKETS.
APPLICATION FILED JULY 22, 1909.

966,873.

Patented Aug. 9, 1910.



Witnesses:
[Signature]
[Signature]

Inventor
Joseph M. Towne
By his Attorney
[Signature]

UNITED STATES PATENT OFFICE.

JOSEPH M. TOWNE, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO SAFETY CAR HEATING & LIGHTING COMPANY, A CORPORATION OF NEW JERSEY.

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METHOD OF MANUFACTURING GASKETS.

966,873.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed July 22, 1909. Serial No. 508,915.

To all whom it may concern:

Be it known that I, JOSEPH M. TOWNE, a citizen of the United States, residing in East Orange, county of Essex, and State of New Jersey, have invented new and useful Improvements in Methods of Manufacturing Gaskets, of which the following is a description.

My invention pertains to the manufacture of that class of gaskets adapted to be repeatedly used in making up temporary steam tight joints and has for its particular object to provide a method of making gaskets which will withstand high internal pressure and repeated application of heavy pressure against the face without crumbling, flattening, or being injured by abrasion.

A further object is to provide a method of making gaskets possessing the above qualifications which shall also possess considerable resiliency and at the same time expand slightly under the action of heat so as to be very applicable for use in making temporary steam tight joints.

As gaskets made in accordance with my method are particularly applicable for use in straight-port steam couplers, the method will be explained in connection with the manufacture of a gasket intended for this use while it will, of course, be obvious that the same method may be pursued in making gaskets for any purpose whatever without departing from the scope of my invention.

In the drawing Figure I shows a cross section of one form of material out of which my gasket may be made. Fig. II shows a slight modification of the material as used in making up my gasket. Fig. III is a cross section of the gasket partly finished in accordance with my method. Fig. IV is a cross section of the mold and one of my gaskets at a certain point in my process which will hereinafter be described. Fig. V shows a cross section of a finished gasket made in accordance with my method.

My improved method of manufacturing gaskets of one form as employed by me is substantially as follows:

Ribbons of suitable length are made up out of strips of fibrous material and vulcanizable elastic material such as rubber or some of its compounds as shown in section in Fig. I, in which 1 represents a section of the fibrous material which, for example, may be asbestos paper and 2 the yielding

vulcanizable material which, for example, may be "usudurian" packing. These materials are cemented together as, for example, by rubber cement and if desired the fibrous material 1 may be provided with small perforations therein, as indicated by 18, for the purpose which will hereinafter be described.

A slightly modified form of ribbon is shown in Fig. II in which the vulcanizable elastic material 2 is shown as having applied to each side thereof a layer of the fibrous material 1.

In making these ribbons for use in the manufacture of my gaskets I find that a very good gasket is produced if asbestos paper $\frac{1}{8}$ inch in thickness be cemented to usudurian packing of about the same thickness.

To make the particular form of gasket shown in section in Fig. III, I first cut one of the ribbons shown in Figs. I and II lengthwise so as to form a ribbon one-half the usual width and cover the same on one side with cement. I then take the metallic thimble 3, having the central aperture 4 and spun flange 5, and wind upon the same a portion of the narrow ribbon as shown clearly in Fig. III; that is, the narrow ribbon is wound to produce a slightly greater diameter than the outside diameter of the flange 5. I then take a ribbon of the regular width as shown in Figs. I and II, cement the same on one side and wind this upon the narrow layers previously applied as clearly shown in section in Fig. III until a suitable outside diameter is produced. I then slip the thimble and gasket over the mandrel 6 of the mold 7 which is provided with a recess 8 to receive the flange of the thimble, and press the gasket back until the same fills the cavity 9 of the said mold. Then the member 10 provided with the knife-edged, tapering portion 11, is passed over the end of the mandrel 6 and the outer edge of the gasket is inserted into the conical bore thereof. Then sufficient pressure is applied as by means of a hydraulic press or other suitable mechanism to force the member 10 into the position indicated in the drawing when the left-hand portion of the gasket will take shape of the mold indicated at 13 and the right-hand face portion of the gasket will be forced into the shape indicated at 12 by the conical surface of the member 10 which, owing to its conical shape, will cause the yielding material to be shaped and forced around the flange 5 and subjected to

at this point to extra pressure. The key 14 is then passed through the mandrel 6 so as to hold the mold 7 and the member 10 in the positions shown in the drawing and retain the gasket in the shape shown under high pressure. The mold is then placed in an oven or suitable vulcanizer and brought to a temperature of approximately 325 degrees Fahrenheit, at which temperature it is held for approximately one hour after which the mold and gasket are allowed to cool and the gasket then withdrawn from the mold, at which time a section of the gasket is substantially as shown in position in the mold in Fig. IV. The gasket is then placed in the lathe and turned down to such diameter as will tightly fit the metallic armor or retaining ring indicated at 15, a suitable shoulder or flange 19 being left as indicated. The ring 15 is then forced into place and the face of the gasket trued up as indicated at 17 and chamfered, or rounded, on the edge as indicated at 16. It will be noticed that this method produces a laminated gasket, the laminae of which are alternately resilient vulcanizable material and fibrous tough wearing material and the action of the pressure of the mold and vulcanizing of the material while under that pressure tends to form the entire mass of yielding material into a permanent structure combining the wearing quality of the fibrous material with the elastic quality of the vulcanizable material. If the fibrous ribbons be provided with holes as indicated at 18 the vulcanizable material will be forced through the same so as to unite on each side thereof.

I do not wish in any way to limit myself to the exact procedure outlined above nor in any way to the apparatus which I have described as useful in the performance of my method of manufacturing gaskets as it is obvious that wide departure may be made without departing from the scope of my invention which is as set forth in the following claims.

I claim—

1. The method of manufacturing gaskets which consists in winding continuous layers of fibrous and vulcanizable materials upon each other to form an annular mass, then subjecting the same to pressure and vulcanizing the same under pressure.

2. The process of manufacturing gaskets which consists of forming an annular structure of alternate and substantially concentric continuous layers of hard fibrous material and softer vulcanizable material, then subjecting the mass to pressure and to high temperature under pressure.

3. The method of manufacturing gaskets adapted to be subjected to high pressure between surfaces which consists in winding alternate layers of hard fibrous material and more elastic vulcanizable material into a

form approximating that of the finished gasket, then subjecting the same to pressure in the direction to be resisted by the finished gasket and vulcanizing the same while under pressure.

4. The process of making gaskets which consists in winding alternate layers of hard fibrous material and more elastic vulcanizable material about a central axis, subjecting the same to radial and longitudinal pressure and subjecting the so laminated material to vulcanizing temperature and then cooling the same.

5. The method of manufacturing gaskets adapted to withstand internal pressure and longitudinal compression which consists in forming alternate laminae of elastic and hard fibrous materials about a central axis, subjecting the same to radial and longitudinal pressure and then raising the temperature to approximately 325 degrees Fahrenheit and then cooling the same.

6. The method of manufacturing gaskets which consists in forming continuous ribbons made up of alternate layers of fibrous and vulcanizable materials, winding said ribbons about a central axis, subjecting the material so wound to pressure and vulcanizing temperature and then cooling the same.

7. The process of manufacturing gaskets which consists in cementing together to form a ribbon layers of asbestos paper and a rubber compound, applying cement thereto, winding said ribbons about a central axis to give the gasket a radial depth, subjecting the mass so wound to pressure and raising the temperature to that sufficient to vulcanize the rubber compound.

8. The process of manufacturing gaskets which consists in cementing together asbestos paper provided with perforations and a rubber compound to form a ribbon, winding said ribbon about a central axis to produce a structure of sufficient radial depth, subjecting the same to high pressure to force the mass into approximately the shape of the finished gasket and subjecting the same to high temperature for the purpose of vulcanizing the vulcanizable portion thereof.

9. The process of manufacturing gaskets which consists in forming ribbons of alternate layers of fibrous and elastic materials, winding the same upon a metallic sleeve, subjecting the same to pressure against the sleeve and vulcanizing under pressure.

10. The process of manufacturing gaskets which consists in winding layers of fibrous and vulcanizable materials about a central axis, compressing the same, subjecting to high temperature for vulcanizing and then turning into the shape desired.

11. The method of manufacturing gaskets which consists in cementing together layers of fibrous and elastic materials, winding the same about a central axis, compressing the

mass so wound, subjecting the same to vulcanizing temperature and then machining the same into the desired form.

12. The method of manufacturing gaskets which consists in building up a structure of alternate laminae of elastic vulcanizable material and fibrous material, compressing the same into a desired conformation and subjecting the same so compressed to the action of vulcanizing temperature.

13. The method of manufacturing gaskets which consist in winding layers of a rubber compound and a fibrous material upon a sleeve provided with an expanded portion, subjecting said winding to radial and longitudinal pressure in such manner as to inclose the said expanded portion of the sleeve, then vulcanizing the rubber compound.

14. The method of manufacturing gaskets which consists in winding laminae of hard fibrous material and softer rubber material about a central axis, subjecting the said materials to sufficient pressure within a mold to take the desired form thereof, then vulcanizing the rubber material while in said mold then removing the same from said mold.

15. The process of manufacturing gaskets which consists in building up a laminated structure of fibrous and vulcanizable materials and forcing a retaining ring thereon.

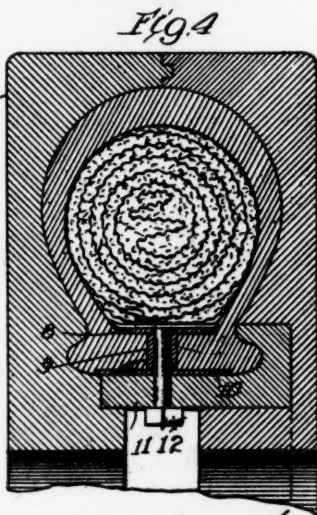
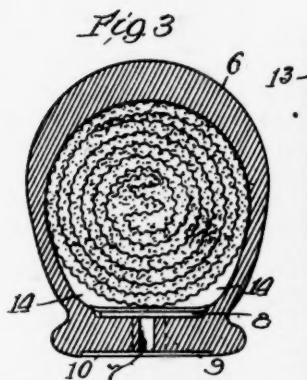
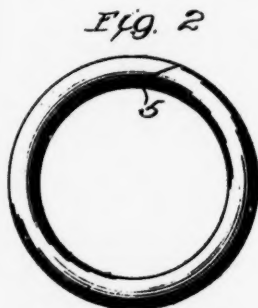
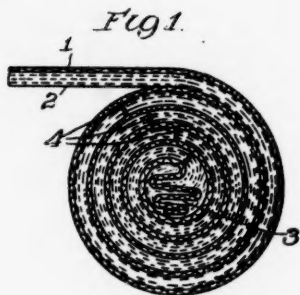
JOSEPH M. TOWNE.

Witnesses:

JOHN T. CLARK,
E. HALL.

1,009,752.

Patented Nov. 28, 1911.



Witnesses:
H. R. L. White
R. A. White

Inventor
Johan Huebner
By Robt. Klotz Atty's

UNITED STATES PATENT OFFICE.

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JOHAN HUERNER, OF CHICAGO, ILLINOIS.

PROCESS OF MANUFACTURING VEHICLE-TIRES.

1,009,752.

Specification of Letters Patent.

Patented Nov. 28, 1911.

Application filed August 26, 1910. Serial No. 579,080.

To all whom it may concern:

Be it known that I, JOHAN HUERNER, a citizen of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Processes of Manufacturing Vehicle-Tires, of which the following is a complete specification.

The main objects of this invention are to provide a process of manufacturing vehicle tires, whereby a very strong and resilient tire may be produced; to provide a process whereby a tire having a sponge rubber filler may be produced which will be uniform in character and of like resiliency throughout; to provide a process of manufacturing vehicle tires having a sponge rubber filling which will overcome any tendency toward unevenness in the spongy formation and produce a tire in which the road pressure will be evenly distributed throughout the spongy mass; and to provide a very cheap, simple and durable tire, having a great amount of resiliency and not likely to get out of repair.

A specific construction formed in accordance with this invention is illustrated in the accompanying drawings, in which:

Figure 1 is a transverse section of the tire filler partly formed, and enlarged for clearness of illustration. Fig. 2 is a side elevation of the completed filler ready to be placed in the outer casing. Fig. 3 is a cross section of the filler and outer casing, before vulcanization. Fig. 4 is a cross section of the tire and vulcanizing mold or form, after vulcanization of the tire. Fig. 5 is a perspective view of one of the attaching plates.

In carrying out the process, a sheet 1 of flexible material, such for instance as canvas or other suitable fabric, is impregnated with a rubber solution and is covered or coated on one side thereof with a layer of rubber compound 2. One edge of the rubber coated sheet is then folded into a plurality of folds to provide a central core 3, and the sheet is then wound around the core 3 in a spiral or convolute form until the filler is of sufficient diameter. During the winding the coated sheet is parted or cut longitudinally of the roll at a plurality of points 4, which are out of radial alinement with each other, and the edges formed by each cut are arranged closely together. With this construction the filler may expand during vulcanization without danger of distorting the filler.

The rubber compound or coating 2 is preferably formed of a combination of rubber and ammonium carbonate in the proportion of one part of the carbonate to twelve parts of rubber, though the proportion may be varied according to the quality of the rubber.

When the filler has been formed to the desired diameter its ends are cut slanting so as to overlap, as shown at 5 in Fig. 1 and the filler is then placed in an outer casing 6 of rubber which has been previously formed to the desired shape of the tire, and is open at 7 along its inner circumference. Attaching plates 8, having internally threaded studs or bosses 9 on one side thereof, are placed in the casing 6 at suitable distances apart and with the studs projecting into the slot or opening 7, the sides of which may be cut away to receive the studs.

A strip 10 of rubber coated fabric or other suitable material is then placed over the opening 7 to seal the same, and the casing is mounted on a ring 11 of a diameter to fit closely to the inner circumference of the casing, and bolts 12 pass through said ring and are secured to the studs 9, thereby holding the edges of the casing together.

An annular vulcanizing mold or form 13 is divided into two parts in a plane at right angles to its axis, and is adapted to fit closely over the casing and ring 11.

When the filler is placed in the casing it does not quite fill the casing, but leaves spaces 14 therein into which the filler may expand during vulcanization. When the casing is placed within the vulcanizing mold and heat is applied to the mold, the ammonia in the rubber coating on the fabric causes the rubber to expand into a sponge like mass between the layers of fabric and entirely fill the casing, and the layers of the filler are vulcanized together and to the casing, thereby forming a unitary mass. The attaching plates are also firmly embedded in the rubber and serve to attach the tire to the wheel.

It is immaterial if the rubber coating on the fabric does not expand to the same degree at all points, since the sponge rubber is confined between the layers of fabric which tend to transmit the pressure evenly throughout the tire.

The tire thus formed will have an inner portion or filler comprising a plurality of convolutions of sponge rubber, separated by convolutions of fabric. The parts or cuts

in the fabric permit the filler to expand evenly throughout.

While I have shown and described but one specific method of carrying out my invention, it will be understood that various details of the method described may be varied or omitted without departing from the scope of the claims.

I claim:

1. A process of manufacturing tires, comprising coating a sheet of fabric with a layer of material adapted to assume a cellular form upon the application of heat, forming the coated sheet into an annular roll, placing an outer casing on the roll, and applying heat to the structure thus formed to vulcanize the layers together and to the casing and form the coating into a cellular mass.

2. A process of manufacturing tires, comprising coating a sheet of flexible material with an admixture of rubber and ammonia, winding the coated sheet into a roll and joining the ends of the roll together, placing an outer casing of rubber on the roll and vulcanizing the layers of the roll together and to the casing, thereby forming a coating into sponge rubber.

3. A process of manufacturing tires, comprising forming a filler of a plurality of convolutions of flexible material coated with

a layer of rubber and ammonia, placing an outer rubber casing on the filler, and heating the structure thus formed to convert the rubber coating into sponge rubber and vulcanize the parts together.

4. A process of manufacturing tires, comprising coating a sheet of flexible material with a compound of rubber and ammonia, winding the sheet into a roll, and bringing the ends of the roll together, placing the roll into an outer rubber casing, and placing the structure thus formed into a vulcanizing form and vulcanizing the parts together and converting the rubber compound into sponge rubber.

5. A process of manufacturing tires, comprising coating a sheet of flexible material with a rubber compound, slitting the sheet at a plurality of points and winding it into a roll, joining the ends of the roll and placing it into a rubber casing, vulcanizing the convolutions of the roll together and to the casing, and converting the rubber compound into sponge rubber.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

JOHAN HUEBNER.

Witnesses:

CHARLES J. MOHR,
JOSEPH KING.

UNITED STATES PATENT OFFICE.

LEO H. BAEKELAND, OF YONKERS, NEW YORK, ASSIGNOR TO GENERAL BAEKELITE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

COMPOSITE CARDBOARD.

1,019,406.

Specification of Letters Patent.

Patented Mar. 5, 1912.

No Drawing.

Application filed November 20, 1910. Serial No. 394,978.

To all whom it may concern:

Be it known that I, LEO H. BAEKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Composite Cardboard, of which the following is a specification.

This invention relates to the manufacture of composite cardboard, or articles thereof, the cardboard possessing great strength and being highly resistant to physical and chemical agents.

The binding mixtures or agents heretofore used for gluing or fastening together several layers of paper for the manufacture of cardboard are of such character that the cardboard becomes soft or disintegrates under certain conditions of use, the binding agents being soluble in hot or cold water, solutions of sodium carbonate, oils, certain neutral solvents, or in phenol or cresol. For some purposes, however, it is desirable to provide a cardboard capable of withstanding all the above solvents or chemical agents, possessing also high dielectric properties, and capable of resisting temperatures above the boiling point of water.

In order to prepare a cardboard having the foregoing characteristics, I may proceed as follows: I apply to the surface of any of the ordinary grades of paper, or to asbestos paper or the like, a coating of a liquid condensation product of phenols and formaldehyde of such character that it is capable of transformation under the action of heat into an insoluble and infusible body. For this purpose I may use either a liquid condensation product of the character described, or a solution of the same in alcohol or other appropriate solvent. This layer is permitted to dry somewhat; when a second sheet of paper is superposed upon the first and similarly treated; or the several layers may be coated and preferably dried before being superposed. The condensation product may be applied to one or both sides of the sheets.

The desired number of sheets having been assembled, the composite article is compacted by pressure, with or without the aid of heat. Heat is now applied in order to effect the transformation of the condensation product into an insoluble and infusible body. The heat may be applied during the operation of pressing or compacting the composite body, or at a subsequent stage of the process; or it may be applied partly during the pressing operation, and continued during subsequent stages. The pressed articles may be heated gradually in an oven, starting at relatively low temperatures, say 40° C. to 80° C., and gradually increasing to higher temperatures, for instance 100° C. to 140° C., the increase in temperature being so gradual as to avoid the formation of blisters or other irregularities. Instead of superposing a number of separate sheets, the liquid condensation product may be applied to a continuous sheet or web, which is then rolled upon itself into the form of a tube, suitable mechanical devices being used. The tubes thus formed may be used as such after being subjected to the hardening operation, or they may be cut and straightened into composite sheets before hardening, according to the use for which they are intended.

The condensation products for use as above may be mixed with pigments, or dyes, or they may be used in conjunction with a certain proportion of resinous material.

I claim:

A composite cardboard consisting of superposed layers of paper or the like combined with intermediate layers of an insoluble, infusible condensation product of phenols and formaldehyde.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

HENRY S. MAY,
WM. A. GORMAN, Jr.

L. H. BAEKELAND & N. THURLOW.

WOOD FINISHING.

APPLICATION FILED APR. 30, 1909. RENEWED DEC. 21, 1911.

1,019,408.

Patented Mar. 5, 1912.

FIG. 1.

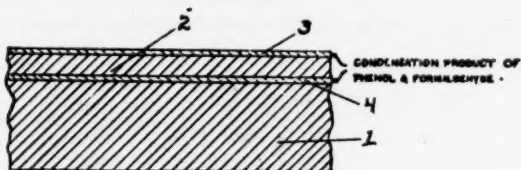
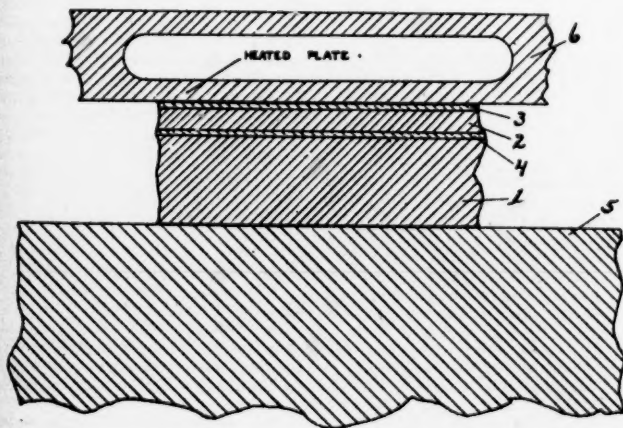


FIG. 2.



Witnesses

C. H. Patten
N. P. Leonard

Inventor:

L. H. Baekeland
Nathaniel Thurlow

By

James D. Brown & Co.

Attorneys

165 UNITED STATES PATENT OFFICE.

LEO H. BAEKELAND AND NATHANIEL THURLOW, OF YONKERS, NEW YORK, ASSIGNORS
TO GENERAL BAKELITE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW
YORK.

WOOD-FINISHING.

1,019,408.

Specification of Letters Patent.

Patented Mar. 5, 1919

Application filed April 30, 1909, Serial No. 493,180. Renewed December 31, 1911. Serial No. 667,312

To all whom it may concern:

Be it known that we, LEO H. BAEKELAND and NATHANIEL THURLOW, citizens of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Wood-Finishing; of which the following is a specification.

This invention relates to the production of articles consisting of or surfaced with wood or like fibrous or cellular materials, to which is applied a coating of a condensation product, specifically an insoluble and infusible synthetic condensation product resulting from the reaction under proper conditions of formaldehyde on phenol or a phenolic body.

The usual methods of finishing wood in the form of furniture or other shapes consists in first imparting to the same a smooth surface, to which is afterward applied one or several coats of varnish, each of which is sand-papery, polished and rubbed to secure a smooth and brilliant finish. This method involves long, tedious and difficult operations, which can be satisfactorily performed only by skilled workmen. For example, in finishing pianos, twelve days to three weeks may be required before the final coat can be applied, the intervening time being consumed in re-varnishing, drying and re-polishing. According to the present invention there may be produced upon wood or like fibrous or cellular bodies, in a few minutes and by a single operation, a finished coat which may be of any desired character or degree of brilliance, and which is harder, more durable and more resistant to the effects of moisture and chemical action than any coat or finish heretofore used. This coat contains as an essential component an insoluble and infusible condensation product of phenol and formaldehyde of the character described in the co-pending applications of L. H. Baekeland, Serial Nos. 358,156, filed Feb. 18, 1907, 383,684, filed July 13, 1907, 397,560, filed October 15, 1907, and 405,021, filed December 4, 1907. As fully explained in the said co-pending applications, there exist a wide variety of condensation products of phenol and formaldehyde, among which are certain partial reaction products which may be either liquid or solid

and which present considerable variation with respect to solubility, these partial reaction products having in common the distinguishing property of undergoing transformation under the influence of heat in the insoluble and infusible condensation product. According to the present invention there may be applied to the surface of the wood an initial condensation product of the above type produced by reacting upon phenol with formaldehyde, in proper proportions, this product being applied either in a liquid or viscous state or in alcoholic or other solution. Or a mixture of approximately equal volumes of commercial formaldehyde and a phenolic body, to which a suitable condensing agent, preferably an alkaline substance may be added, can be applied to the surface of the wood and then react to yield the initial condensation product above referred to. This initial condensation product may form slowly at ordinary temperatures, or its formation may be hastened by slight heating. In whatever way the initial condensation product may have been applied, the wood is now slightly heated and after cooling it appears dry to the touch. The surface of the wood to be finished, assuming that a brilliant finish is desired, is then pressed against a perfectly smooth and hard surface, preferably a sheet of metal as for example steel or brass properly polished and provided with a thin plating of nickel. During the operation of pressing heat is applied, the temperature being raised sufficiently to transform the initial condensation product quickly into the final hard insoluble condensation product. This operation is best performed in a so-called veneer press provided with heating means; such heating means may comprise a flame, or steam heated platens, or any approved electrical or other heating device. Whatever source of heat be employed, it is advisable to conduct the operation at comparatively high temperatures. At temperatures of 150° to 200° the reaction whereby the soluble and fusible initial product is transformed into the insoluble and infusible final condensation product occurs quickly and may be completed under proper conditions in from ten to twenty minutes. The fact that these high temperatures may be safely used with

jury to the wood is highly important for the economical and rapid practice of the method, and is probably due to the protective or sealing effect of the coating substance, maintained under pressure during the transformation. It is thus possible in a few minutes to provide a wooden surface with a gloss and finish which could heretofore be secured only at great expenditure of time and labor. Furthermore, the thin layer of the infusible and insoluble condensation product forms a hard surface which cannot be scratched by the nail, and which is capable of withstanding water, steam, alcohol and most chemicals. Not only is the surface highly ornamental in character, but the reason of the peculiar properties of the coating material there is imparted to the wood a higher degree of resistance to wear than has heretofore been obtained by any method, not excepting the laborious methods now referred to.

The procedure may be modified in various ways. For example, instead of pressing the wood against a smooth or plane surface, it may be pressed against a grained, mottled or matte surface, or against any ornamental surface presenting a suitable design. Relief to be imparted to the finished article. The process may also be modified as follows: The soft wood is impregnated with the initial condensation product in any of the ways above described, and during the act of finishing is compressed in such manner as to increase its density while at the same time imparting to it a surface polish and any desired shape or configuration. The coating material may in all cases be colored as desired by the addition of dyes or pigments.

A highly advantageous embodiment of the process consists in coating veneer by pressing or otherwise with the initial condensation products or the materials that can render them, and then applying the coating material to a wooden or other base, the condensation products serving not only as a coating material for the exposed surface of the veneer but attaching the veneer in a more effective manner than is possible with glue. The composite body is then introduced in the veneer press, and under the influence of heat and pressure the desired infusible and insoluble condensation product is produced. There is thus obtained not only the desired finish on the exterior surface of the veneer, but the veneer is firmly and permanently attached to the wood or other material which it covers. The advantages of the method of procedure are obvious. The bond which binds the veneer to the wood is of such character that neither heat nor solvents will affect or loosen it. The veneered article is for this reason superior to the known products wherein

the veneer is simply glued to the wood and afterward finished by the usual varnishing methods. The present method moreover involves but a single operation which is very quickly and economically performed. In the same way, a veneer or surface of wood can be applied to metallic or other bases, as for example to steel or aluminum plates, asbestos board or fabric, cement, stone or other incombustible supporting bodies. These non-combustible substances are thereby covered with a highly ornamental thin coating of veneer, forming articles which while possessing the appearance of highly ornamental wood are incombustible, far stronger and more durable than wood, and subject to none of its disadvantages.

Ceiling or wainscoting panels, parquet flooring, and like articles, can be made by applying a thin coat of wood or veneer on any desired support or base. In the case of ceilings or panels, the ornamental effect may be increased by imparting, during the act of finishing, any desired design or shape by embossing or otherwise. Similarly, the veneer may be applied to any stiff paper or pulp-board, and in order to increase the resistance of such pervious bases to moisture and atmospheric agencies, or to stiffen them, the paper or board may be impregnated with suitable substance, preferably the condensation product above mentioned; or the base may be strengthened by the use of metallic tension members, as for example wire netting.

In order to shorten the operation and to render it more practical, it is desirable to transform or harden the initial condensation product after it has been applied and before the act of pressing until it has assumed a semi-hardened state. In fact, it may be desirable to transform it into the so-called intermediate condensation product. This can be very simply effected by drying the coated article at a moderate temperature or by adding a suitable proportion of condensing agents until the condensation product has acquired a consistence which makes it sufficiently hard to proceed to the operation of pressing, but has not yet acquired the maximum hardness of the so-called final condensation product. The coated article is then subjected as above described to the joint action of heat and pressure, whereby the transformation into the final condensation product is very speedily effected.

The methods herein described are also applicable for finishing and imparting a durable and brilliant surface to materials having the essential characteristics, for the purposes of this invention, of wood, such for example as cardboard, pulpboard, paper or like fibrous or cellular bodies.

A product in accordance with this invention and a process of forming the product

are diagrammatically illustrated in the accompanying drawing, wherein:—

Figure 1 is a sectional view of a product in accordance with our invention; and Fig. 2 is a sectional view illustrating one method of forming the product.

In said drawing the numeral 1 represents a base of wood or other material, 2 a veneer of wood applied thereto, and 3 a superficial coating of the final condensation product of phenol and formaldehyde. A layer of the condensation product between the base and veneer is indicated at 4. In Fig. 2 the parts above described are illustrated as assembled upon a suitable support 5 and subjected thereon to pressure exerted between this support and the heated plate 6, having such finish as it is desired to impart to the surface of the completed article.

The word "phenol" as employed in the claims is intended to include such phenolic bodies as are the equivalents of phenol for the purposes of this invention, and the word "formaldehyde" is intended to include the polymers of formaldehyde.

We claim:

1. The method of finishing wood which consists in applying thereto a coating consisting essentially of a condensation product of phenol and formaldehyde which is capable of transformation under the influence of heat into an insoluble and infusible coating material, and then pressing the coated surface, with simultaneous application of heat, against a surface having the desired finish.

2. The method of finishing wood which consists in applying thereto a coating consisting essentially of a condensation product

of phenol and formaldehyde which is capable of transformation under the influence of heat into an insoluble and infusible coating material, partially effecting this transformation, and then pressing the coated surface, with simultaneous application of heat, against a surface having the desired finish.

3. The method of attaching and finishing a veneer in a single operation, which consists in applying to the veneer a coating consisting essentially of a condensation product of phenol and formaldehyde which is capable of transformation under the influence of heat into an insoluble and infusible substance, and then pressing the coated veneer against the base to be veneered, with simultaneous application of heat, thereby simultaneously finishing the veneer and permanently securing the same to the base.

4. As a new article of manufacture, a base, and a veneer of wood therefor, said veneer attached to said base by means of an infusible and insoluble condensation product of phenol and formaldehyde, and having a surface coating thereof.

5. As a new article of manufacture, a non-combustible base, and a veneer of wood therefor, said veneer attached to said base by means of an infusible and insoluble condensation product of phenol and formaldehyde, and having a surface coating thereof.

In testimony whereof, we affix our signatures in presence of two witnesses.

LEO H. BAEKELAND.

NATHANIEL THURLOW.

Witnesses:

H. S. TARKELL,

MARY L. SHORT.

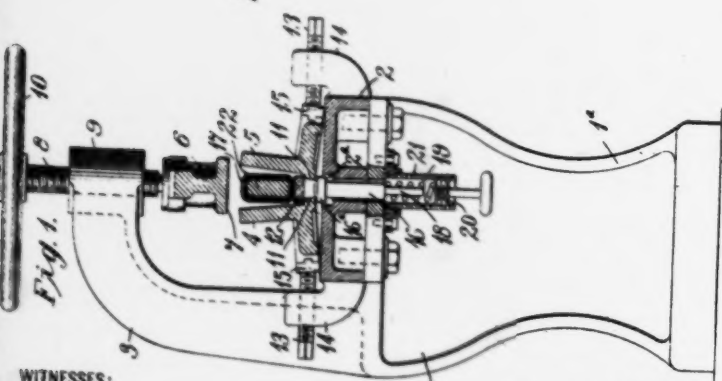
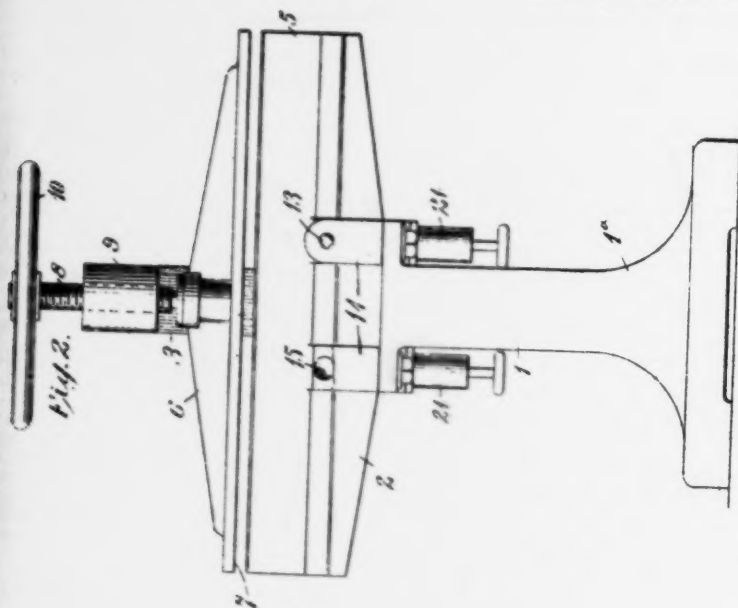
E. HAEFELY.
FORMING PRESS.

169-170

APPLICATION FILED JULY 16, 1909.

1,028,108.

Patented June 4, 1912.



WITNESSES:

Frederick H. Miller
John J. Carboys

INVENTOR
Emil Haefely
BY
Wiley C. C. C.
ATTORNEY

171 UNITED STATES PATENT OFFICE.

EMIL HAEFELY, OF BASEL, SWITZERLAND, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

FORMING-PRESS.

1,028,108.

Specification of Letters Patent.

Patented June 4, 1911.

Application filed July 10, 1908. Serial No. 507,001.

To all whom it may concern:

Be it known that I, EMIL HAEFELY, a citizen of the Republic of Switzerland, and a resident of Basel, in Switzerland, have invented a new and useful Improvement in Forming-Presses, of which the following is a specification.

My invention relates to forming presses, and it has for its object to provide a device of this character that shall be specially adapted for shaping or forming insulating tubes of rectangular cross section.

It is frequently desirable to produce insulating tubes of square or rectangular cross section for use with electrical apparatus, and tubes of this sort are ordinarily produced by reheating a tube of circular cross section and forming it into the desired shape.

According to my present invention, I provide a forming press which is simple and durable in construction and which produces a substantially uniform pressure on all sides of a square or rectangular object, so that it is particularly well adapted for the forming process above referred to.

Figure 1 of the accompanying drawings is a partially sectional elevation of a forming press constructed in accordance with my invention, and Fig. 2 is an elevation at right angles to that of Fig. 1.

Referring to the drawings, the structure here shown comprises a body member 1 which may be supported from any suitable base 1*, a bed plate 2 secured to the body member, and a bracket arm 3 which is integral therewith and extends upwardly therefrom.

A pair of angle plates 4 and 5 are disposed on the bed plate 2 in substantially parallel planes and a pressure member 6 having a plane bottom surface 7 is suspended from a feed screw 8 which is substantially vertical and is threaded through a hub 9 upon the end of the bracket 3. A hand wheel 10 is secured to the upper end of the feed screw 8, and a rotatable connection is established between the lower end of the feed screw and the pressure member so that the latter may be raised and lowered without being turned on its axis as the hand wheel is rotated. The angle plates 4 and 5 and pressure members 6 are equal in length and their actual length will be determined by the nature of the work for which the press is intended.

The angle plates are similar to each other

and each is provided with a lateral projection 11 which extends throughout its whole length and produces a shoulder on its vertical pressure surface. A bar 12, which is slightly less in width than the thickness of the article to be formed, rests on the shoulders provided by the projections 11 and is adapted to have the work laid upon it before the pressure is applied. The angle plates 4 and 5 may be adjusted laterally, by means of screws 13, which are threaded through projections 14 on the bed plate 2, and engage cup-shaped recesses 15 in the outer edges of the said angle plates.

The adjacent edges of the angle plates are raised slightly from the bed plate 2 by means of spring-supported rods 16, except when the pressure member 6 is forced into engagement with the upper surface of a tube 17, which is intended to be illustrative of any suitable object in process of formation on the press. Each of the rods 16 is provided with a head or engagement 16* which is adapted to lie in a recess 9 in the bed plate 2, through which the rod 16 projects except when the downward pressure of the member 6 is withdrawn. A spring 19, which is coiled about the shaft 18 of the rod 16 to force the rod upwardly, and a nut 20 is provided for adjusting said spring. Tubes or guides 21 are secured to the base 1 to provide continuations of the holes in the bed plate through which the rods 16 project. The lower end of each of the tubes 21 is internally screw-threaded to receive the nut 20.

The operation of the press is as follows. Assuming that an insulating tube has been softened and forced upon a mandrel 22 of rectangular shape in cross section, if the tube and mandrel are laid upon the bar 12 of the press, as shown in Fig. 1 of the drawings, it may be permanently formed into the shape which it has assumed by rotating the hand wheel 10 to bring the pressure member 6 into engagement with the surface directly opposite the bar 12. The downward pressure upon the mandrel is transmitted to the bar 12 and thence through the projections 11 to the rods 16, which are consequently forced downwardly below the surface of the bed plate in opposition to the springs 19. Since the adjusting screws 13 prevent the angle plates from separating at their lower edges,

continued downward pressure on the tube or mandrel will serve to throw the upright portions of the angle plates into engagement with the sides of the tube and thereby compress the tube between their inner faces.

It is obvious that the structural details of the press may be modified to accommodate different kinds of work, and I desire that variations which do not depart from the spirit of my invention shall be included within its scope.

I claim as my invention:

1. A forming press comprising vertically movable bottom and top pressure plates and laterally movable side plates that are interlocked with the bottom plate, and means for moving the top plate to engage the upper edges of the side plates and move them toward each other to compress an interposed object between them.

2. A forming press comprising a base plate, a pair of angle plates having substantially parallel upwardly projecting sides and lateral projections on their adjacent vertical faces, a bottom plate located between the angle plates and resting on said projections, a top plate adjustably supported above the side plates and parallel

to the base plate, adjustable means for limiting the lateral displacement of the angle plates, and yielding means acting upwardly upon the lateral projections of the angle plates.

3. A forming press comprising a base plate having projecting lugs, a pair of angle plates disposed between the lugs on the base plate, adjusting screws threaded through the lugs and engaging the outer edges of the angle plates, a bottom plate disposed between the angle plates and resting on lateral projections thereof, a pressure plate adjustably supported above the angle plates and having its bottom surface parallel to the base plate, and spring-actuated rods which project through the base plate and are adapted to lift the adjacent corners of the angle plates from the base plate when the downward pressure of the top plate is removed.

In testimony whereof, I have hereunto subscribed my name this 8th day of July, 1909.

EMIL HAEFELY.

Witnesses:

R. J. DEARBORN,

B. B. HINES.

173 UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO CONDENSITE COMPANY OF AMERICA, OF EAST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MATERIAL FOR ROOFING, &c., AND METHOD OF PREPARING THE SAME

1,077,113.

Specification of Letters Patent.

Patented Oct. 28, 1913.

No Drawing.

Application filed September 1, 1910. Serial No. 580,088.

To all whom it may concern:

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Material for Roofing, &c., and Method of Preparing the Same, of which the following is a description.

My invention relates to a new article of manufacture in the class of substances used for roofing and other building purposes, which substance or composition may likewise be used for the manufacture of furniture, window casings, sashes, and trimming for fire-proof buildings.

The object of my invention is the production of relatively light-weight sheets of a durable material, which is non-inflammable, water-proof, and infusible, and which will not soften or blister by the heat of the sun, or be destroyed by the action of light, heat and moisture, and which may readily be applied and supplied in a variety of permanent colors. The material in transparent or translucent form is likewise adapted for use in roofs of factories in which increased light is desired, it thus being possible to cause the whole roof to transmit light to the interior.

The invention comprises a building material in sheeted form of an infusible condensation product of a phenolic body with formaldehyde or other substance containing the methylene radical CH_2 , intimately mixed or combined with a non-inflammable chlorinated organic radical, a mineral pigment or filler, and reinforced with a fibrous or filamentary substance which may be of organic or inorganic origin, such as hemp, cotton, flax, jute, hair, wood pulp, asbestos, or filamentary metal. By a condensation product of phenolic bodies I mean infusible, hard final condensation products, such as are described by me in my application Serial No. 496,060, Plastic composition and process of manufacturing the same, filed May 14, 1909, and Patent No. 1,020,593, granted March 19, 1912, Phenolic condensation product and method of preparing same, and the similar final condensation products described by Baekeland in his Patent No. 942,699, December 7, 1909, Method of making insoluble products of phenol and formaldehyde, and other patents of the same inventor and

others. By non-inflammable organic radical I intend to include such bodies as solid or liquid substitution products of a halogen, preferably chlorine, which are stable and may successfully be incorporated with the mass at some stage of its formation previous to the infusible state. Such bodies as the chloronaphthalenes, chlorobenzenes, chlorotoluenes, chlorophenols, chloroanthracenes, and perchloroethanes may be used, but on account of cheapness and other advantages produced, I prefer to use a chloronaphthalene, which may either be the liquid mono or di-chloronaphthalene or any of the higher chloronaphthalenes which have sufficiently low melting points to readily be incorporated with the phenolic condensation body previous to rendering the same infusible by the application of heat. The higher chlorinated naphthalenes are, however, more efficient in rendering the product non-inflammable. I have found that these bodies may be dissolved in an initial or incompletely condensed condensation product previous to hardening by the completed reaction or in the ingredients which react upon sufficient application of heat to yield the final condensation product, and are retained therewith in solid solution or solid emulsion after the product has become hardened and infusible and cannot readily be separated from the condensation product. The mass may be colored by suitable mineral pigments, and may be incorporated with cheap filling bodies such as plaster of Paris, barium sulfate, sand, clay, infusorial earth, etc. For reinforcing the product, I prefer to use asbestos fiber and a coarse meshed gauze of fine wire, as this product is the most fire-resisting. I may, however, use other fibrous substances or woven fabrics and still maintain a sufficient degree of non-inflammability to render the product useful for the purpose.

As I have indicated, the condensation product may be formed either by heating a sufficient amount of phenol and formaldehyde or their equivalents to form a final infusible product and carrying out the process in two or three stages, as indicated by Baekeland, or I can first form a fusible soluble phenolic condensation product or phenol resin, as described in my applications referred to, and cause a further reaction to

take place between the same and a sufficient amount of hexa-methylene-tetramin, tri-oxymethylene, or other substance containing the methylene radical CH_2 , which will react with phenol resin on application of sufficient heat to form the final hard infusible product. I consider the latter method preferable.

The product contemplated by my present invention may be formed by incorporating chloro-naphthalene or equivalent substance as described to the extent of 10 to 60 per cent. of the weight of the phenolic body, with the phenolic body before the reaction has taken place, or at some stage in the reaction previous to the formation of the final infusible product. The product thus formed is incorporated with as much asbestos as it will take without becoming too plastic to be readily formed in sheets by calender rolls or pressing between plates. To 2 parts of asbestos and 2 parts of the condensation product containing the chloro-naphthalene are suitable proportions for sheeting on the calender rolls. When the product is made in sheets by hydraulic pressure, a much larger amount of fibrous filler and mineral matter may be used. In this case the initial or partly condensed phenolic condensation product, or phenol resin mixed with the chloro-naphthalene or equivalent substance, and a sufficient quantity of a formaldehyde or methylene-containing substance is dissolved in a suitable solvent and thoroughly mixed with the fibrous material until every particle becomes coated, and is then rapidly dried, preferably in a vacuum drying chamber, whereby the solvent may be recovered. The dried mass is then comminuted and pressed in sheets between plates in imitation of slate or shingles, or it may be pressed in dies in imitation of tiling. When the material is desired in flexible sheets which may be supplied in rolls, a finely woven fabric such as canvas is impregnated with a solution of the product in its incomplete state of reaction in a process such as described by Bacheland, or with a solution of phenol resin and a hardening methylene-containing agent in a process such as described in my previous application referred to, and the solvent evaporated. The fabric is then subjected to heat and pressure for the purpose of hardening and consolidating the same into an impermeable, flexible, difficultly inflammable sheet. The sheets may be nailed or screwed to the rafters of the roof of a structure in the same manner as roofing paper.

As an example of a composition which may be formed in sheets by calendering is the following:—100 parts by weight phenol resin as described in my previous application (referred to), 10 to 60 parts tetra-chloro-naphthalene, 7 to 12 parts hexa-methy-

lene-tetramin or equivalent hardening agent, 50 to 200 parts comminuted asbestos fiber or mineral filler, 10 to 50 parts cow hair, 2 to 10 parts pigment. The proportion of fibrous and mineral constituents and pigment may be varied up to the limit at which the mass may be calendered.

In preparing this composition, the phenol resin and the chloro-naphthalene are first melted together in a suitable mixing vessel and kept at 200 to 230 degrees F. of heat, while the hexa-methylene-tetramin or equivalent methylene-containing agent is mixed therewith together with the pigment. The mass is quickly cooled before reaction can take place and powdered, and the powdered substance then mixed with the fibrous and powdered filling bodies. It is then mixed in suitable kneading machines or ore mixing rolls, heated with steam or hot water, and the plastic mass calendered in sheets of the required size and thickness. The sheets thus formed are heated to complete the condensation reaction to a temperature of from 260 to 300 degrees F. This may be done between sheets of polished metal in ovens or between steam heated platens, with or without hydraulic pressure. The sheets may be reinforced by calendering the same onto a coarse woven fabric of metal wire or other coarse woven fabric. An example of a composition designed to be pressed as a dry comminuted powder in heated molds in sheet or special forms is the following:—100 parts by weight phenol resin, 10 to 60 parts by weight halogenized naphthalene or equivalent halogenized organic radical, 7 to 12 parts hexa-methylene-tetramin or equivalent methylenating agent, such as para-formaldehyde or thio-formic aldehyde, 100 to 300 parts neutral solvent, such as acetone, alcohol, methyl-alcohol, amyl-alcohol, amyl-acetate, or combination of the same which will act as a neutral solvent, 100 to 400 parts fibrous and powdered filler, such as asbestos fiber and powder, cow hair, wood pulp, cotton lint, plaster of Paris, barium sulfate, clay, infusorial earth, silica, slag, wool, powdered mica, etc., or mixtures of the same, 2 to 10 parts pigment. The phenol resin may be melted and mixed with the halogenized organic radical and the methylenating agent at a low heat, cooled, powdered, and dissolved in the solvent and incorporated with the pigment. The solution is then thoroughly mixed with the filling ingredients and dried, preferably in a vacuum at a low heat, whereby the solvent may be recovered, and when dry, the mass, if lumpy, is comminuted and loaded onto the press plates or into suitable dies, and pressed hot until it has become consolidated. It is subsequently hardened without pressure, or the hardening reaction may be completed in the press, if desired. These sheets may also be rein-

forced with a coarse wire or other fabric by inserting the same in the powder before pressing.

Having now described my invention, what I claim and desire to secure by Letters Patent is as follows:—

1. As a new article of manufacture, sheets adapted for roofing or building purposes of an infusible phenolic condensation product having a stable halogen substitution product of an organic radical incorporated therewith, substantially as described.

2. As a new article of manufacture, a non-inflammable sheet composed of a phenolic condensation product having a halogenized naphthalene incorporated therewith, substantially as described.

3. As a new article of manufacture, a non-

inflammable sheet formed of an insoluble infusible phenolic condensation product, a halogen substitution product of an organic radical, and a fibrous filling agent, substantially as described.

4. As a new article of manufacture, a non-inflammable sheet formed of an insoluble infusible phenolic condensation product, a halogen substitution product of an organic radical, and a fibrous filling agent with a reinforcing net or fabric, substantially as described.

This specification signed and witnessed this 19th day of August 1910.

JONAS W. AYLSWORTH

Witnesses:

DYER SMITH,
H. H. DYKE

179 UNITED STATES PATENT OFFICE.

LEO H. BAEKELAND, OF YONKERS, NEW YORK, ASSIGNOR TO GENERAL BAKELITE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MACHINE ELEMENT.

1,160,364.

Specification of Letters Patent.

Patented Nov. 16, 1915.

Application filed December 16, 1910. Serial No. 397,906.

To all whom it may concern:

Be it known that I, LEO H. BAEKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Machine Elements, of which the following is a specification.

This invention relates to the manufacture of gears, pulleys and other machine elements, one of the principal objects of the invention being the provision of elements of this character which, while having the requisite strength, resistance to wear, and inertness to oils and other lubricants, shall be relatively noiseless in operation as compared with metal gears.

A further object of the invention relates to the manufacture of such elements, combined with graphite or similar solid lubricants in such manner as to render them self-lubricating in operation.

I have found that certain condensation products of phenolic bodies and formaldehyde or their equivalents, which, after being subjected under proper conditions to the action of heat become hard, infusible and extremely resistant to chemical agents including vegetable and mineral oils, greases, etc., are particularly adapted for the purposes above defined. Such condensation products, particularly when compounded with suitable filling materials, usually of a fibrous character, are readily cut into the desired forms; or they may be directly molded into such forms. The articles so prepared possess a high compressive strength but a relatively lower tensile strength, and for this reason it is found necessary in practice to use the compositions in combination with appropriately designed metallic reinforcing members.

In order to produce a gear, as an illustrative example of the invention. I may proceed as follows: From a sheet of metal, usually steel or brass, I cut or stamp a number of appropriately formed plates or disks, these plates being preferably perforated, ribbed, corrugated, studded, pitted, scored, or otherwise formed to unite or interlock with and firmly retain the composition. The composition, either in the form of previously formed sheets or as a plastic mass, is then interposed between the metal plates and the whole is consolidated under high

pressure, preferably in a heated hydraulic press. The composition possesses such degree of plasticity that under this pressure it may be forced through the perforations of the plates, or into the recessed portions of the plates, and the whole structure becomes firmly consolidated. At the same time the condensation product in the composition undergoes a chemical transformation (polymerization) whereby it loses its plastic character and becomes hard, infusible, and resistant to solvents as above noted.

A condensation product suited for use as above may be prepared by heating commercial phenol or cresol, their homologues or mixtures, with commercial formaldehyde, in approximately equal volumes. The reaction is facilitated by the use of suitable accelerating or condensing agents, as bases, acids or salts. The resultant product, after elimination of water, appears as a more or less viscous liquid, or in case the reaction has been permitted to proceed further, it may appear as a pasty mass or even as a brittle solid, which may however be liquefied by heat. All of these forms are soluble in alcohol, acetone and phenol, but possess the property of undergoing transformation, upon sufficient heating, into an insoluble and infusible mass. For convenience of reference the soluble condensation products will be referred to as "partial condensation products." The insoluble product derived therefrom by heating may be designated the "final condensation product."

The filling materials with which the partial condensation products are compounded are preferably but not necessarily fibrous in character, as for example wood fiber, asbestos or the like; or sheets or plates of wood, cardboard, paper or similar porous materials may be impregnated with the liquid or dissolved partial condensation products, such impregnated sheets or plates being inserted between the metal plates.

After the composite structure has been consolidated and hardened as above described, it may be turned, cut or otherwise fashioned into the desired form; for example, gears may be cut from disks in gear-cutting machines of the usual type. Or the operation may be simplified by the use of appropriate molds in which the article may be pressed directly into the desired form, thereby avoiding further machining or mill-

ing, or reducing such finishing operations to a minimum.

The structure may be further reinforced by any desired means, as for example by bolts or rivets securing the metal plates, by external reinforcing plates or members, etc.

In a simple embodiment the structure may comprise opposite side plates of metal, with an intermediate layer of the above-described composition, the side plates being bolted or riveted together through the intermediate layer, or otherwise adapted to interlock therewith. In order to strengthen the device to the degree desired, any required number of intermediate metal plates may be provided, these intermediate plates also being preferably perforated or otherwise fashioned to interlock with the composition, whereby the whole is united into a unitary structure.

Gears and other machine elements so constructed possess the advantage that they are quite unaffected by water, steam, or oils, and may be operated in casings filled with oil. They are capable of withstanding comparatively high temperatures and in general of enduring conditions which are destructive to most plastic compositions. They possess great hardness and toughness and excellent wearing qualities. They present the advantage as compared with metal gears that they are comparatively silent in operation.

For certain purposes, it has been found desirable to incorporate with the composition, before hardening the same, a suitable proportion, as for example 10 per cent., by weight of the mass, of graphite. The graphite serves its usual function as a lubricant and enhances the smooth-running and noiseless character of the gear.

Certain specific illustrative embodiments of the invention are shown in the accompanying drawing, wherein:—

Figures 1 to 5, inclusive, are transverse central sectional views of toothed gear wheels formed in accordance with the invention.

In all of said figures 1 represents the compositions containing the hard, infusible and insoluble condensation products of phenolic bodies and formaldehyde.

In Fig. 1 the composition is illustrated as lying between perforated metal plates 2 and in the perforations 3 formed in said plates. In Fig. 2 the composition 1 is overlaid on each side by internally recessed metal plates 2. Fig. 3 shows a construction similar to that of Fig. 1, except that there are also provided internal metallic reinforcing plates 5 perforated at 6. Fig. 4 shows external plates 2 having inwardly directed projections 7; this figure also illustrates the use of internal corrugated reinforcing members 8, which may or may not be perforated. Fig. 5 illustrates the use of external reinforcing members 2, secured by rivets or bolts 4, and provided also with internal reinforcing members 5 perforated at 6.

I claim:

1. A machine element, comprising a plurality of substantially parallel, spaced, metallic reinforcing members, in combination with a homogeneous and non-plastic body lying between said members and interlocking therewith, said body consisting essentially of a hard, infusible, insoluble and non-plastic phenolic condensation product compounded with a fibrous filling material.

2. A machine element, comprising a plurality of substantially parallel, spaced, perforated, metallic reinforcing plates, in combination with a homogeneous and non-plastic body lying between said plates and interlocking through the perforations thereof, said body consisting essentially of a hard, infusible, insoluble, and non-plastic phenolic condensation product, compounded with a fibrous filling material.

In testimony whereof, I affix my signature in presence of two witnesses.

LEO H. BAEKELAND

Witnesses:

HERBERT S. MAY,
WM. S. GOMOX, JR.

181 UNITED STATES PATENT OFFICE.

LEO H. BAKKELAND, OF YONKERS, NEW YORK, ASSIGNOR TO GENERAL BAKELITE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MATRIX.

1,233,298.

Specification of Letters Patent.

Patented July 17, 1917.

Application filed March 26, 1912. Serial No. 688,408.

To all whom it may concern:

Be it known that I, LEO H. BAKKELAND, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Matrices, of which the following is a specification.

This invention relates to improvements in the art of printing, and to matrices for use in connection therewith. According to the invention, a suitable material, usually fibrous, and usually in the form of a sheet or fabric, is impregnated with such phenolic condensation products as may be transformed or converted into an infusible substance, and the resulting preparation is molded into the form of a matrix, the condensation product with which it is impregnated being transformed, either during or after such molding into the hard and infusible state.

The matrix thus prepared is capable of withstanding the action of molten type metal or similar alloy during the period necessary for its solidification, without undergoing material distortion or flexion, and without gassing or sticking. It is capable therefore of affording exact and clear impressions.

The particular variety of infusible condensation product above described is insoluble in all ordinary solvents and is found to be sufficiently resistant to heat to render it adapted for use for the preparation of matrices which are capable of receiving molten alloys for the production of stereotype plates. The invention will be described by reference to certain preferred embodiments thereof, it being understood that it is not limited to the precise procedures or manipulations described.

The following is an illustrative example of the invention:—

To 1000 grams of phenol are added 40 grams of caustic soda dissolved in 100 grams of water, and 900 grams of 40 per cent. commercial formaldehyde, and the mixture is boiled in a suitable vessel, preferably provided with a return condenser, for about one hour, then quickly cooled. The liquid thus obtained may be suitably diluted by the addition of water or other solvent either before or after the boiling process.

The proportion of caustic soda or of other

ingredients may be varied, or other condensing agents, such as ammonia or other bases, acids or salts may be used, or the initial condensation product may be prepared in any other suitable way.

With the liquid thus obtained ordinary blotting paper is impregnated, and thereafter dried, the temperature being raised somewhat toward the end of the drying, but not sufficiently to destroy the plasticity of the sheet. If necessary, the impregnated sheet is flattened in a calender or flattening press and in this condition constitutes the matrix blank or mat.

The invention is especially important for the printing of newspapers, where a printing block of type metal must be cast or molded rapidly and inexpensively from the original type composition. In this case, the prepared or impregnated sheet constituting the mat or blank is first pressed, in a hot press, against the type, cut, or engraving to be reproduced, and thus a negative matrix thereof is obtained; from this matrix, a positive reproduction or stereotype is molded or cast, from which the final printing is performed in the usual way. In this case, the matrix or negative is simply used to cast one or more positive reproductions in type metal or other suitable material. This casting or molding is performed in accordance with the methods well known in the art.

The method as above described possesses very important advantages over those heretofore known, involving the use of ordinary paper matrices: first, the matrix gives a closer, better and more accurate reproduction; second, the matrix may be made so rigid as not to require any great amount of "bolstering" or "padding" on the back, for the purpose of reinforcing the blank spaces. This is highly important, not only by reason of the saving of labor, but because the loss of time required for this tedious operation is largely or entirely avoided, and the time which elapses between the moment the type leaves the typesetter's hand and the moment when the edition is ready for the press, is correspondingly abbreviated. This time element is of the utmost importance in newspaper printing.

One of the most advantageous methods of preparing such matrices is as follows:

The sheet of paper is prepared, or im-

pregnated and dried, as described above, and is forced in the hot press against the type, cut, etching or engraving. The time varies according to conditions, and depends especially on the temperatures employed. Under good conditions and using a temperature of about 180° C., the time required has been reduced in practice to about 60 seconds, although under less favorable conditions several minutes may be required. It is merely necessary to heat in the press long enough to secure the degree of hardness requisite at this stage of the process, which degree may be less than the maximum hardness of which the composition is capable.

The sheet may now be further heated by means of a so-called "scorcher" which by the further application of heat brings the hardness to a maximum, completes the transformation of the condensation product into an infusible body, and at the same time expels any gaseous or volatile substances which might interfere with the further operation of casting the molten metal.

For ordinary press work, a flat "scorcher" may be used, that is to say a hot plate, heated by any suitable means, and upon which the matrix is placed for a short time, or until a condition of hardness sufficiently approximating the maximum is attained.

In case a curved matrix is desired, as for rotary press work, it should of course be adapted in curvature to the requirements of the casting machine and press used. While the necessary curvature may be imparted at any stage of the process before the condition of ultimate hardness is reached, it has proven satisfactory in practice to curve the matrix during the "scorching" process above referred to. This is readily accomplished by providing a properly curved scorcher in which the matrices are simultaneously curved and heated. Such scorcher may be heated by gas flames, or electrically or otherwise, as may be preferred.

It has been found that if the paper used for impregnation is of too loose a texture, it may occur that in the act of casting in the auto-press, the molten type metal may be forced into the texture of the paper, thus spoiling the matrix as well as the cast stereotype. In order to avoid this, it is advantageous to provide the surface of the sheet of impregnated paper with a thin sheet of paper which is less pervious and of finer texture, as for instance tissue paper or the so-called "onion-skin" paper. Or instead of using ordinary paper of uniform texture, a special paper may be prepared, whereof the body is more porous than the surface, the latter being preferably somewhat similar to the so-called onion-skin paper or fine tissue paper, and presenting the desired close and compact texture. The use

of starch or similar materials has also proven advantageous in insuring better adherence and a closer texture of the surface.

The invention is not limited to the use of an impregnating solution prepared as above described, inasmuch as condensation products capable of transformation into infusible products may be otherwise prepared, as for example according to the methods described in my prior U. S. Patents 942,809 and 942,699, or by other methods; or, obviously, the infusible condensation product may be indirectly prepared in accordance with such methods as are disclosed in my U. S. Patent No. 1,038,475.

Instead of paper as the material to be impregnated, satisfactory results have been obtained with woven fabrics, and even with wood. Paper is however usually preferred, as being more readily available and well suited for almost all practical cases.

Instead of starting with sheets of paper or of fibrous material, the initial condensation product may be simply mixed or compounded with fibrous materials, as for example pulp or wood fiber, and this composition can be molded into sheets or blocks or into forms of any character whatsoever from which the printing may be done directly, or which may be used as matrices for the molding of metallic stereotypes, precisely as described above with reference to the impregnated or coated paper.

If the paper or plastic mass is properly prepared and properly dried, no trouble will be experienced from sticking; but it has been observed that sticking can be prevented by the use of proper materials, as for instance talcum, stearin, graphite, and similar bodies. Such bodies may be introduced into the mass of the paper by any known means or simply distributed on the surface thereof.

In the above specification, as well as in the following claims, the word "phenols" is meant to designate not only the first member of the phenol group, but its homologues and isomers, or phenolic bodies, or mixtures thereof, which are equivalent in this reaction. And in the same way the polymers of formaldehyde, or other substances which may engender formaldehyde, may be used as equivalents of formaldehyde.

I claim:

1. A matrix for stereotype or like plates comprising a supporting sheet of fibrous material having incorporated therewith an infusible phenolic condensation product, said matrix capable of withstanding the action of molten type metal or similar alloy for the period necessary for its solidification, without material distortion, flexing, gassing or sticking, and capable of affording clear impressions thereof.

2. A mat or blank for stereotype or like

matrices comprising a supporting sheet of fibrous material having incorporated therein a phenolic condensation product which is capable of being transformed or converted into an infusible substance, said mat or blank adapted to receive readily an impression from the type, but transformable by heat into a matrix which is capable of withstanding the action of molten type metal or similar alloy for the period necessary for

its solidification, without material distortion, flexing, gassing or sticking, and is capable of affording clear impression thereof.

In testimony whereof I affix my signature in presence of two witnesses.

LEO H. BAEKELAND.

Witnesses:

A. R. BRENNER,
JOS. C. FULLER.

Fig. 1.



Fig. 1^A

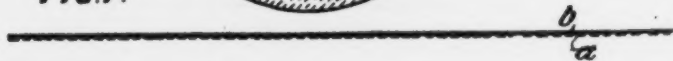


Fig. 2.

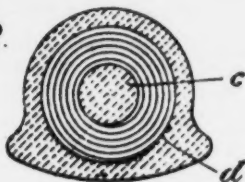


Fig. 2^A



Fig. 3.

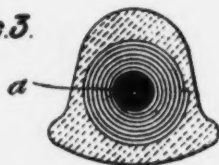


Fig. 3^A

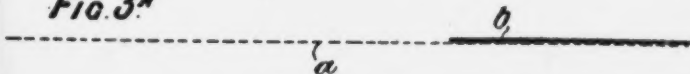


Fig. 4



This Drawing is a reproduction of the Original on a reduced scale.

Improvements in or relating to Elastic Tyres for the Wheels of Cabs, Carriages, &c.

COMPLETE SPECIFICATION.

Improvements in or relating to Elastic Tyres for the Wheels of Cabs, Carriages, and similar Vehicles.

I, JOSEPH THOMAS WICKS, of Ferndale, Tamworth Road, Gravelly Hill, Birmingham, in the County of Warwick, India Rubber Expert and Factory Manager, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

At present, cab tyres are made of solid rubber by the squirting process, that is, the plastic rubber is forced through a die of any given shape, and forthwith vulcanized.

My improvement consists in building up vehicle-wheel tyres from sheets of rubber and rubbered fabric combined, and then moulding the same into the desired shape, and finally vulcanizing the tyre.

In carrying out my invention, I take cotton duck, woven wire, or other fabric of a suitable kind and convenient weight, and pass it between callender rollers running at an even or a friction speed, with rubber in a plastic state, and continue the rolling operation until the rubber is worked through and through the fabric, the fabric forming with the rubber a fibrous sheet.

I then callender onto this fibrous sheet, a thin sheet of rubber. This compound sheet is then cut up on the bias, the width of strip depending on the size of the section of the tyre required.

Several widths are pieced together lengthways to make a strip, say 60 feet long. This strip is then twisted or rolled up longitudinally on to itself by means of a hose-making machine, or other device, so that the rubber and fabric form themselves into a cord spiral in cross section.

Exactly the same form can be produced by rolling by hand, but this hand process is somewhat slower. Instead of a spiral effect, the fibrous fabric can be built up by super-imposing one layer of rubber and fabric upon another continuously, until a body of material sufficiently large has been obtained for any desired shape.

The cord thus produced, still in a plastic or yielding state, is then compressed or moulded into the shape required for the tyre, and finally vulcanized.

In the accompanying drawing I have shown a cab tyre embodying my invention in several forms.

Fig. 1 shows one form in cross section, and

Fig. 1^a shows the compound strip from which it is made.

Figs. 2 and 2^a, and Figs. 3 and 3^a, are similar views of two other forms, and Fig. 4 shows, in cross section, yet another modification.

Referring to Figs. 1 and 1^a, *a* is the rubbered fabric, and *b* the rubber sheet callendered onto it, both being rolled up together, and embedded in a coating of solid rubber, which is moulded into shape and vulcanized.

In Figs. 2 and 2^a, the tyre is so contrived that a rubber core *c* is made, surrounded by coiled rubbered fabric and rubber sheet, which, in turn, are embedded in solid rubber, a metallic fabric *d* being added, to strengthen the tyre near the base.

In Figs. 3 and 3^a, the material from which the tyre is coiled is so prepared that the rubbered fabric is predominant at the centre, and is surrounded by rubbered fabric combined with rubber sheet.

In Fig. 4, the rubber fabric is not coiled, but folded, before being embedded in its outside covering of solid rubber.

Improvements in or relating to Elastic Tyres for the Wheels of Cabs, Carriages, &c.

The form of the tyre may be further varied by varying the arrangement of the fibrous material with regard to the rubber sheet, as will be evident from the foregoing.

The proportion of woven or other fabric to the rubber will determine the cost, lightness, elasticity, and strength of the tyre.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

The manufacture of tyres for the wheels of vehicles, by rolling or coiling up sheets of rubbered fabric and rubber in the manner described, moulding the same into shape, and vulcanizing them, substantially as set forth.

Dated this 11th day of September 1900.

NEWTON & SON,
Agents for the Applicant.

189 U.S. D.C., S.D. of Ohio. W.D., Equity No. 214.

S-487

Westinghouse E. & M. Co. v.

Formica Ins. Co.

Defendant's Exhibit O'Connor

File Wrapper.

17. 15 39 15

NUMBER (SERIES OF 1900).

745,616

1913

(EX'R'S BOOK.) 205.2N

1-7 1913

PATENT No. 1284432

Name Daniel J. O'Connor, Jr.,
Assor to Westinghouse Electric and Manufacturing
Company, a corp. of Pa.

of Pittsburgh,

County of

State of Pennsylvania.

Invention Process of Making Composite Material
Insulating-Material-and-Process-of-Making-the-Same

Division of App., No.	PARTS OF APPLICATION FILED.	ORIGINAL.		RENEWED.	
	Petition	Feb 1, 1913			, 191
	Affidavit	" ", 1913			, 191
	Specification	" ", 1913			, 191
	Drawing	, 191			, 191
	Photo Copy	, 191			, 191
	First/Fee Cash \$15.	Feb 1, 1913			, 191
	" " Cert.	, 191			, 191
	Appl. filed complete	Feb 1, 1913			, 191
	Examined and passed for issue Apr 9, 1913				, 191
	W. L. Redrow	Exr. Div. 15		Exr. Div.	
	Notice of Allowance	Apr 18, 1913			, 191
	Final Fee Cash \$20 ⁰⁰	By Commissioner. Oct. 16, 1913			, 191
	" " Cert.	, 191			, 191
	Patented	Nov. 12			, 1918

Attorney Wesley G. Carr, P. O. Box 911 Pittsburgh Pa

Associate Attorney

(No. of Claims Allowed 12) Title as Allowed Process of Making Composite
Material (Cl. 154-35)

O. G. Cls 1 and 7

1913

C O N T E N T S:

1. Application 2 papers. OK
2. Rejection SEP 17 1913
3. Amendment A SEP 17 1914
4. Rejection NOV 7 1914
5. Amndt. B Oct. 26, 1915
6. Rejection, Nov. 13, 1915
7. Amdt. C Nov. 10, 1916
8. Final Rejection, Nov. 14, 1916
9. Amdt. D Feb. 8, 1917 not entered
10. Letter, Feb. 21, 1917
11. Amdt. E Apr. 26, 1917
12. Letter, May 14, 1917
13. Amdt. F Aug. 18, 1917
14. Appeal to the EX'RS IN CHIEF (#10) Aug. 18, 1917
15. Letter, AUG 30 1917
16. Letter Sept. 7, 1917
17. Ex's Statement Sept. 21, 1917
18. Hearing Dec. 6, 1917
19. Brief DEC 6 1917
20. Supplemental Brief Dec 14 1917
21. Decision by Board. (Ex.rev.) MAR 29 1918
22. Notice of Decision. MAR.29 1918
23. Amdt. G (Ex's) Apr. 8, 1918

MAIL ROOM
FEB 1 1913
U.S. PATENT OFFICE

DIVISION 37, Paper No. 1
JUN 18 1913
U. S. PATENT OFFICE.

APPLICATION FOR LETTERS PATENT
Petition

To the Commissioner of Patents:

Your Petitioner, Daniel J. O'Connor, Jr., a citizen of the United States and a resident of Pittsburgh, in the County of Allegheny and State of Pennsylvania, whose post-office address is 1223 North Hegley Ave., Pittsburgh, Pa. prays that Letters Patent may be granted to Westinghouse Electric & Manufacturing Company, a corporation created and existing under the laws of the State of Pennsylvania, for the **IMPROVEMENT IN INSULATING MATERIAL AND PROCESS OF MAKING THE SAME**, set forth in the annexed Specification, and he hereby appoints **WESLEY C. CARR**, (Registered No. 1205), whose post-office address is Box 911, Pittsburgh, Pa., his attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Daniel J. O'Connor Jr

Specification

To all whom it may concern:

Be it known that I, Daniel J. O'Connor, Jr. - - - - -
a citizen of the United States and a resident of Pittsburgh,
in the County of Allegheny and State of Pennsylvania, have in-
vented a new and useful **IMPROVEMENT IN ^{Composite} INSULATING-MATERIAL**
AND-PROCESS OF MAKING THE-SAME. [^]
of which the following is a specification:

per G My invention relates to insulation materials and
 " " methods of producing the same, and it has particular reference
 to methods of manufacturing composite materials, such as card-
 board.

5 One object of my invention is to provide an insulating
 material which is light, strong, and insoluble and has a high
 dielectric strength.

Another object is to provide a simple and efficient
 process of producing an insulating material of the above-
 10 indicated character in large quantities as a commercial pro-
 duct.

Heretofore, insulation material such as cardboard,
 per A composed of layers of paper glued together, has ^{proved} provided more
 or less unsatisfactory because of various defects, such as
 15 absorption of moisture from the atmosphere, inability to
 resist heat and chemical action, and lack of physical strength.
 " " I to be used
 In the use of ^Iinsulating material in connection with switch-
 boards and wireless telegraph and other high voltage instal-
 20 must be free from these defects, and, in addition,
 letions, it is essential that the above qualities be combined
 must possess
 with high dielectric strength. My invention provides a
 process of manufacturing an insulating material possessing
 these qualities in a high degree.

In carrying out this process, any suitable fabric,
 such as paper, muslin, or other cloth, and fibrous or porous
 25 material of any kind may be used. If paper is used, the
 fabric is preferably baren paper, kraft paper or the so called
 per B "miscoelium" miscofolium
 " A "miscoelium" paper which has a coating of mica flakes, of any
 desired thickness, is first coated on one side with an ad-
 30 hesive liquid insulating material, preferably ^{suitably} that known as
 per A a condensation product
 per B bakelite and consisting of ^{an insoluble compound} of phenols
 " A and formaldehyde. The coating is performed by passing the
 paper between two rollers, the bottom one of which dips into
 the liquid material which is contained in a tank. The thick-

the
 per A ness of ^Acoating retained by the paper is regulated by vary-
 " " ing the distance between the two rollers and by ^{altering} the viscosity
 of the liquid. The paper is then dried by passing it over
 a series of rollers in a steam-heated oven. The prepared paper is
 5 out into sheets of any desired size but, for convenience,
 preferably 18" x 36" or 36" x 36", as desired. A plate is
 built up to the required thickness by placing the sheets to-
 gether with the untreated side of each sheet next to the treat-
 ed side of the adjacent sheet, the number of sheets required
 10 for any desired thickness of finished material having been
 Insert A previously determined.

The built-up plate is then placed between thin sheet
 steel plates on which has been rubbed a small amount of machine
 per A oil. Any desired number of the steel plates containing the
 15 sheets of paper are placed between the platens of a hydraulic
 " " press which have been previously heated ^{preferably} by steam. The press
 is closed and pressure applied, which may be as high as 800
 pounds per square inch, or approximately, 535 tons on an
 area 36" x 36". Satisfactory results have also been obtained
 20 by using lower pressures. Heat is applied, preferably by
 steam, while the material is in the press. The pressure is
 kept constant during the period of heating and the subsequent
 period of cooling. These periods are varied according to the
 thickness of the plate approximately in accordance with the
 25 following table:

Thickness of Plate.	Time under steam.	Time of cooling.
Up to 3/16"	15 min.	10 min.
3/16" to 5/8"	30 "	15 "
5/8" to 7/8"	45 "	20 "
7/8" to 1 1/4"	1.00 hr.	25 "

The effect of heating and pressing the plate is to
 firmly cement together the sheets of paper and to further im-
 pregnate the paper with the bakelite.. The plate is transformed

per A into a hard and compact mass, which is infusible and insoluble.
" "

After cooling, the plates of insulation are removed from the press and then clamped between steel plates to prevent warping during baking, which is the last step in the process and which is employed for the purpose of removing any moisture remaining in the insulation. The plates are then placed in ovens, air pressure of approximately 140 pounds per square inch is applied, and the temperature is regulated between 100° and 140° C. The air pressure may be omitted if the plates are clamped sufficiently tight. These conditions are maintained for approximately eight hours, during which time any remaining moisture is expelled. The plates are then removed from the oven and the finished product is allowed to cool.

While the process above described is that used for making plates, the insulating material may be produced in the form of channel pieces or tubes that are cylindrical or rectangular in cross section or of other shape, as desired, by pressing in forms of the proper shape.

The resultant material has a specific gravity of approximately 1.25. It is practically non-absorbent, even when soaked in hot water, and is insoluble. Consequently, there is no tendency for any given structure of this material to change its dimensions when subjected to moisture or atmospheric conditions. The ordinary reagents have no appreciable effect under ordinary conditions. The substance will withstand a constant temperature of 150° C. without deterioration and up to 300° C., if temporary. The tensile strength of this insulating material is approximately 20,000 pounds per square inch, which exceeds that of wood, fibre and other similar

materials. The material is very hard, having an average
per A of more than 40 by the ^{Brinell} ~~swanneh~~ test. It can be turned and
bored in the same manner as wood, adapting it for various
shapes and purposes. In addition to the above named
5 qualities, the dielectric strength is high, averaging 820
volts per mil. for plates 1/16" to 1/4" in thickness.

While I have described the process in full, it is
obvious that the details thereof above given may be varied
as conditions require, without departing from the spirit
10 of my invention.

It is particularly understood that the term "fabric",
as used in the specification and claims, is not limited to
" " paper, which is described and claimed specifically, but is used
in its broad sense to include muslin, or other cloth, asbestos,
15 or any other fibrous or porous material.

I claim as my invention;

1. A composition of matter possessing high electrical insulating properties and comprising a hard and compressed mass composed of paper and bakelite.
2. A non-absorbent and insoluble composition of matter having great dielectric strength and comprising a hard, compressed and baked mass of sheets of paper and phenolic products.
3. An insulating material having a specific gravity of substantially 1.25, a tensile strength of substantially 20,000 lbs per square inch, and high dielectric properties, and comprising a hard and compressed mass of paper and an insoluble product of phenol and formaldehyde.
4. An insoluble and non-absorbent insulating material having a specific gravity of substantially 1.25, a tensile strength of substantially 20,000 lbs. per square inch and great dielectric strength and comprising a hard, compressed and baked mass of paper and a product of phenol and formaldehyde.
5. The process of manufacturing insulating material which consists in superposing layers of coated fabric, applying pressure and heat thereto and then again applying heat.
6. The process of manufacturing insulating material which consists in superposing layers of coated paper and applying heat and pressure thereto.
7. The process of manufacturing insulating material which consists in superposing layers of coated insulating fabric, applying heat and pressure thereto, and then applying a greater degree of heat and a lower pressure.
8. The process of manufacturing insulating material which consists in superposing layers of coated paper, simultaneously heating and pressing the said layers of paper, and

Sub A3

then cooling the the plate and thus formed, while under pressure.

9. The process of manufacturing insulating material which consists in superposing sheets of coated paper, heating and cooling the said sheets of paper while under a relatively high pressure, and then heating the plate thus formed while under a relatively low pressure.

10. The process of manufacturing insulating material which consists in coating paper with bakelite, superposing layers of said paper, applying heat and pressure thereto, and then again applying heat and pressure.

11. The process of manufacturing insulating material which consists in coating paper with a product of phenol and formaldehyde, drying said paper, superposing layers of said paper, applying heat and pressure thereto and then again applying heat and pressure.

12. The process of manufacturing insulating material which consists in superposing sheets of paper coated with bakelite, applying to said sheets of paper a pressure of between 100 lbs. and 200 lbs. per square inch and applying heat while the pressure is maintained, cooling the plate thus formed, and then applying an increased heat to the plate while under pressure.

13. The process of manufacturing insulating material which consists in superposing sheets of paper coated with bakelite varnish, applying thereto a pressure of 300 lbs. to 800 lbs. per square inch, heating and cooling the plate thus formed, while under said pressure, and then heating to a temperature of 100° to 170° C., while under pressure.

Insert C'

/C'

/E'

Insert K'

in Testimony Whereof, I have hereunto subscribed my name this
30th day of January 1913.

Witnesses:

Daniel J. O'Connor, Jr.

B. B. Hines

M.C. Hertz

Oath.

State of Pennsylvania)
County of Allegheny) ss.

Daniel J. O'Connor Jr.---, the above-named petitioner,
being sworn, deposes and says that he is a citizen of the United
States and a resident of Pittsburgh - - - -, in the county of
Allegheny and State of Pennsylvania; that he verily believes him-
self to be the original, first and sole inventor of the Improve-
ment in INSULATING MATERIAL AND PROCESS OF MAKING THE SAME - - -
----- described and claimed in the
annexed specification; that he does not know and does not believe
that the same was ever known or used before his invention or dis-
covery thereof, or patented or described in any printed publication
in any country before his invention or discovery thereof, or more
than two years prior to this application, or in public use or on
sale in the United States for more than two years prior to this
application; that said invention has not been patented in any coun-
try foreign to the United States on an application filed by him or
his legal representatives or assigns more than twelve months prior
to this application; and that no application for patent on said
improvement has been filed by him or his representatives or assigns
in any country foreign to the United States.

Daniel J. O'Connor Jr

SWORN TO and subscribed before me this 30th
day of January, 1913.

B. B. Hines

Notary Public Allegheny County, Pa.
My Commission expires JAN 21 1917

(Seal)

Div. 37 Room 108
 Address only
 "The Commissioner of Patents,
 Washington, D. C."
 and not any official by name.

2-200

Paper No. 8.

All communications respecting this
 application should give the serial number,
 date of filing, title of invention, and
 name of the applicant.

DEPARTMENT OF THE INTERIOR
 UNITED STATES PATENT OFFICE

M.P.T.

WASHINGTON
 MAILED

Sep. 17. 1913.

" " "

Wesley C. Carr,

P. O. Box 911,

Pittsburgh, Penna.

Please find below a communication from the EXAMINER in charge of the application of

D. J. O'Connor, Jr., for patent for Insulating Material and

Process of Making the Same; filed Feb. 1, 1913; #745,616.

Thomas Swing

Commissioner of Patents.

Claims 1 to 4, inclusive, are rejected on

Jefferson, 563,716; July 7, 1896; or
 Emmett, 803,816; Nov. 7, 1906, in view of
 Beekeland, 1,019,406; Mar. 5, 1912, or

"Information Number One" of the General Bakelite Co., New York
 and Beekeland on "The Synthesis, Constitution and Uses of Baka-
 lite" reprinted from Journal Ind. & Eng. Chem. of March 1909.
 No invention would lie in substituting the insulating material
 shown by Beekeland for that of Jefferson or Emmett.

Claims 5 to 13, inclusive, are rejected on the references
 cited against Claims 1 to 4, inclusive. The degrees of press-
 ure and heat applied employed when using bakelite are thought
 to be only such as would be employed by one acquainted with
 the nature of the insulating substance used and the properties
 of this material are fully disclosed by the references cited.

H. Lewis

Examiner.

H.O.C.

MAIL ROOM
SEP 17 1914
U. S. PATENT OFFICE.

DIVISION 37, Paper No. 3
SEP 18 1914
U.S. PATENT OFFICE.
Amendment A

200

IN THE UNITED STATES PATENT OFFICE.

In re Application of

Daniel J. O'Connor, Jr.,

Filed February 1, 1913,

Serial No. 745,616,

Insulating Material and Process of Making the Same.

XXXXXXXXXX

Pittsburgh, Pa., Sept. 15, 1914.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:

Acknowledging the Examiner's letter of Sept. 17, 1913, I hereby authorize and request amendment of this application, as follows:

✓ Page 2, line 13, for "provided" substitute "/proved/.

✓ Page 2, line 17, cancel "In the use of"; for "insulating" and substitute "/insulating/; after "material" insert "/to be used/.

✓ Page 2, line 19, after "lations" insert "/must be free from these defects, and, in addition,)"; cancel "it is essential that the above qualities be combined".

✓ Page 2, line 20, for "with" substitute "/must possess/.

✓ Page 2, line 27, for "micarte" substitute "/microbolum/.

✓ Page 2, line 30, for "an insoluble compound" substitute "/a condensation product/.

Page 2, line 31, after "coating" insert "/operation/.

- ✓ Page 3, line 1, after "of" insert ~~-- the --~~.
- ✓ Page 3, line 2, after "by" insert ~~-- altering --~~.
- ✓ Page 3, line 11, after "determined." insert

A' --the upper sheet is preferably placed with its treated side down, in order that both the top and the bottom of the finished plate will present untreated faces.--

✓ Page 3, line 14, for "containing" substitute ~~-- carrying --~~.

✓ Page 3, line 16, place a comma after "heated" and insert ~~-- preferably --~~.

✓ Page 4, line 1, after "mass" place a period and cancel the remainder of the line.

✓ Page 4, line 2, cancel "soluble".

✓ Page 4, line 7, after "insulation" insert ~~--~~ and for transforming the bakelite completely into its infusible and insoluble condition.--

✓ Page 5, line 2, for for "Brinell" substitute ~~-- Brinell --~~.

✓ Page 5, line 13, place a comma after "paper".

✓ Cancel the claims and insert in lieu thereof the following:

43
Per B 1. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a phenol-aldehyde condensation product, superposing the coated sheets with the coated side of each sheet in engagement with the uncoated side of the adjacent sheet, applying heat and pressure to the superposed sheets, and then applying further heat.

1 §. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a ^{phenolic aldehyde} phenol-aldehyde condensation product, superposing the coated sheets, applying heat and pressure to the superposed sheets, and then applying

a greater degree of heat and a lower pressure.

2 §. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a phenol-aldehyde condensation product, superposing the coated sheets, simultaneously heating and pressing these superposed sheets and then cooling the plate thus formed while under pressure.

13 2 § 4. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a phenolic phenolic condensation product, superposing the coated sheets successively heating and cooling the superposed sheets while under relatively high pressure and then heating the resulting plate while under relatively low pressure.

4 §. The process of making a laminated composition that consists in coating one side of each of a plurality of sheets of fibrous material with a phenol-aldehyde condensation product superposing the coated sheets, and applying sufficient heat and pressure to the superposed sheets, and then again applying heat and pressure to solidify the condensation product.

3 § 6. The process of manufacturing insulating material which consists in superposing sheets of paper coated with a phenolic condensation product Per B Per C bakkite, applying to said sheets of paper a pressure of between 100 lbs. and 200 lbs. per square inch and applying heat while the pressure is maintained, cooling the plate thus formed, and then applying an increased heat to the plate while under pressure.

4 § 7. The process of manufacturing insulating material which consists in superposing sheets of paper coated with containing a phenolic condensation product 100 lbs. bakkite varnish, applying thereto a pressure of 200 lbs. to 600 lbs. per square inch, heating and cooling the plate thus formed, while under said pressure, and then heating to

a temperature of 100° to 170° C., while under pressure.

-
- Substitute 8. An insulating composition comprising a
- B' mass of fibrous material intimately associated with a condensation product phenol-aldehyde and/ possessing high dielectric strength.
9. A laminated composition comprising sheets of fibrous material and a phenolic condensation product, and possessing high dielectric strength.
- A3 10. A laminated composition comprising alternate sheets of fibrous material and a phenol-aldehyde condensation product intimately associated by means of heat and pressure and possessing high dielectric strength.
11. A laminated insulating material comprising alternate sheets of fibrous material and a phenol-aldehyde condensation product intimately associated by means of simultaneously-applied heat and pressure, and having a specific gravity of substantially 1.25 and a tensile strength of substantially 20,000 pounds per square inch.
-

R E M A R K S.

In view of the Examiner's citations, the claims have been carefully revised and a new set of claims are presented herewith which, it is submitted, distinguishes patentably from the prior art of record and for which allowance is, therefore, requested.

The patents to Jefferson and Emmett disclose laminated insulating fabrics made from various sorts of sheet material held together by means of the ordinary adhesives and varnishes commonly used in this art, such as oxidized linseed oil, gum copal and gutta-percha. Neither of these patent suggest the use of bakelite or any other substances having the peculiar properties of bakelite. It is submitted that these references should no

745,616.

longer be considered in connection with applicant's claims for the reason that the binder which applicant uses requires special treatment and cannot be substituted for the binders of the references without the exercise of such a high degree of skill and ingenuity as to clearly indicate invention.

The foregoing considerations apply to all of applicant's present claims, but more specifically to those claims in which the specific properties of applicant's material and the specific steps of his processes are set forth. Neither the patent to Beekelend nor any other publication cited by the Examiner constitute a valid anticipation of these claims, and are pertinent to the present case only in so far as they disclose certain general properties of bakelite and certain methods of treating it. Applicant fails to discover in these references anything that teaches the process which he employs and which is covered by the claims, and the fact that this process is not an obvious selection of steps is shown by the fact that the process now claimed was devised only after a long series of experiments, during which all the information in the cited periodicals was readily available to him. Such facts have frequently been held to constitute clear evidence of invention and applicant believes that the present claims should, therefore, be allowed. Such action is respectfully requested.

Respectfully,

W. G. Carr,

Attorney for Applicant.

Div. 57 Room 107

Address only
 "The Commissioner of Patents,
 Washington, D. C."
 and not any official by name.

2-306

Paper No. 4

All communications respecting this
 application should give the serial number,
 date of issue, title of invention, and
 name of the applicant.
M.P.T.

DEPARTMENT OF THE INTERIOR
 UNITED STATES PATENT OFFICE

WASHINGTON

Nov. 7, 1914.

MAILED

" " "

Wesley G. Carr,

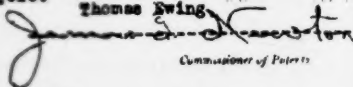
P. O. Box 911, Pittsburgh,
 Penna.

Please find below a communication from the EXAMINER in charge of the application of

D. J. O'Connor, Jr., Insulating Material and Process of Making

the Same; Feb. 1, 1913; #745,616.

Thomas Swing



Commissioner of Patents

In response to amendment of Sep. 17, 1914:

The claims are rejected on the references of record, for
 the reasons given.

In the further prosecution of the case, applicant should
 comply fully with the requirements of Rule 68 and in so doing
 should consider each of the references cited and point out in
 detail why they do not meet the claims. A mere general state-
 ment that they do not, as applicant has wrote regarding the
 Beekelund references, is not sufficient to comply with the
 Rule.

W. S. Buckman

H. O. C.

Examiner.

Per W. S. R.

Div. 37, Room 107

Serial No.

Paper No. 5
B.

206

MAIL ROOM
OCT 26 1915
U. S. PATENT OFFICE.

U.S. PATENT OFFICE.
FILED
OCT 26 1915
DIVISION IV.

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor, Jr.

Filed Feb. 1, 1913,

Serial No. 745,616,

Insulating Material and Process
of Making the Same.

---000---

Pittsburgh, Pa., Oct. 23, 1915.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:-

Acknowledging the Examiner's letter of
Nov. 7, 1914, I hereby authorize and request amend-
ment of this application as follows:

Page 2, line 29, for "preferably" substitute
--suitably--.

Page 2, line 30, for "phenol" substitute
--phenols--.

Cancel claim 1.

Claim 2, line 3, for "aldhyde" substitute
--aldehyde--.

Claim 6, line 3, for "bakelite" substitute
--a phenolic condensation product--.

Claim 7, line 3, cancel "bakelite"; same line,
after "varnish" insert -- containing a phenolic condensa-
tion product--.

Cancel claims 8, 9, 10 and 11.

Renumber claims 2 to 7 as claims 1 to 6.

inclusive.

Add the following new claims:

B'
Per E

~~7. The process of making a laminated composition that comprises treating a plurality of sheets of fibrous material with a phenolic condensation product, superposing the treated sheets, stacking a plurality of oiled metallic plates alternated with sets of the said superposed sheets, and subjecting the stacked material to heat and pressure.~~

5 8. The process of making a laminated composition that comprises treating a plurality of sheets of fibrous material with a phenolic condensation product, superposing the treated sheets, stacking a plurality of oiled metallic plates alternated with sets of the said superposed sheets, subjecting the stacked material to heat and pressure, cooling the stacked material while under pressure, and baking the composite sheets.

6 9. The process of making a laminated composition that comprises treating a plurality of sheets of fibrous material with a vernish containing a phenolic condensation product, drying the treated sheets, superposing the said sheets, stacking a plurality of oiled metallic plates alternated with sets of the said superposed sheets, subjecting the stacked material simultaneously to heat and to pressure not substantially exceeding 800 pounds per square inch, cooling the stacked material under pressure, and thereafter heating material
the composite temperature under lower pressure. C'

Per C

Insert C'

REMARKS.

The claims have again been reviewed in connection with the Examiner's citations and have been modified in certain particulars in order to render them still more clearly distinguished from the references.

The Jefferson patent discloses a process and material which resemble the subject matter of the present application only in that they relate to laminated insulating material. There is no suggestion that sheets of fibrous material are to be coated or impregnated with any substance whatever. Still less is there any anticipation found in this reference for the detailed process steps which are set forth with greater or less exactness in the present claims.

The Emmet patent discloses a laminated insulating material composed of sheets of asbestos soaked with a varnish containing a drying oil and varnish gums, the material being solidified by the oxidation and baking of the varnish. Here again, there is no anticipation of the steps which compose applicant's process and which were devised only after a long series of careful experiments in view of the peculiar requirements of the adhesive material which applicant employs. For example, applicant's present process involves subjecting a stack of material treated with a phenolic condensation product to the simultaneous action of heat and pressure and thereafter baking the plate thus formed at a higher temperature and under lower pressure. This procedure is nowhere suggested in the reference.

The Bakeland reference approaches most nearly to the subject matter of this application, since it deals

with the production of composite material from fibrous sheets of condensation products. This reference, however, fails to set forth the precise and necessary process steps which are now claimed, and therefore fails as an anticipation equally with the two references above discussed. Mackelend merely specifies that the stack of treated sheets is pressed with or without the application of heat and that the pressed articles may thereafter be baked in an oven. This procedure falls far short of the complete scheme of manipulations which, as applicant has discovered, are necessary to produce a satisfactory product. The step of cooling the pressed plates while still under pressure is nowhere suggested in the reference, nor is it suggested that the degree of heat in the baking step shall be greater than that in the preliminary heating step and that the pressure employed in the baking step shall be less than that employed in the first heating operation.

The Examiner is believed to be in error in supposing that the precise manipulations which are now claimed are obvious to persons acquainted with the nature of the material used. Applicant has been acquainted with this material since it was first prepared commercially, but it was necessary for him to engage in long and expensive experimentation before arriving at the relatively simple process which is sought to be covered by the claims of this case. The Examiner is requested to reconsider the claims in view of the foregoing considerations. Three new claims are presented herewith which set forth in still greater detail the steps of applicant's process. Allowance of the application is respectfully requested.

Respectfully,

Wesley G. Carr
Attorney for Applicant.

The Commissioner of Patents,
Washington, D. C.
and not any official by name.

H. D. B G.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON Nov. 15, 1915.

Mailed " " "

Wesley G. Carr,
P. O. Box 911,
Pittsburg, Pa.

Please find below a communication from the EXAMINER in charge of the application of
Daniel J. O'Connor, Jr., Serial No. 745,616, filed Feb. 1, 1913,
for Insulating Material and Process of Making the Same.

James S. Ewing
Thomas Ewing, Attorney at Law

In response to the amendment filed Oct. 26, 1915:

The title of the case should be amended to agree with the
claims now in the case.

As now advised, claim 1, 3 and 8 may be allowed, though
"relative" should be changed to relatively in line 7 of claim 3.

Claim 2 does not recite anything novel over Beekeland of
record, especially when considered in connection with Annet or
Jefferson. The steps of this claim are the very usual ones of
heat and pressure and subsequent cooling.

Claim 4 is also rejected on the same references as claim
2, merely repeating the application of heat and pressure not in
itself displaying invention.

Claims 5 and 6 are clearly alternative, being specific to
different methods. Applicant should elect which he will prose-
cute in this case.

Claim 7 recites nothing patentable over claim 2 and is re-
jected. The mere superposition of the sheets alternated with
the metal plates does not involve invention. See

Beekeland, 1,019,408, Mar. 5, 1912, (144-309).

9. Evidently "temperature" is not intended in line 11 of claim
9. This claim is apparently alternative to claim 5, though it
might be retained with claim 6.

Gray

W. L. Redrow Examiner.

Div. 15, Room 308
MAIL ROOM
NOV 10 1916
U.S. PATENT OFFICE.

Serial No.
Paper No. 7
U.S. PATENT OFFICE,
FILED
NOV 11 1916
DIVISION XV.

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor, Jr.,
Filed Feb. 1, 1913,
Serial No. 745,616,
Insulating Material and
Process of Making the Same.

-----OOO-----

Pittsburgh, Pa., Nov. 8, 1916.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:-

Acknowledging the Examiner's letter of
Nov. 13, 1915, I hereby authorize and request amendment
of this application as follows:

In the preamble, change "INSULATING" to --COMPOSITE--

Claim 3, last line, for "relative" substitute
--relatively--.

Claim 4, line 4, cancel "and".

Claim 4, line 5, after "sheets" insert
--to unite and compact the said sheets--; same line,
cancel "again"; same line, before "heat" insert
--sufficient--.

Claim 4, last line, before "heat" insert
--sufficient--; same line, before the period insert
--to solidify the condensation product--.

Claim 5, line 3, cancel the last mentioned
"of".

Claim 6, line 3, for "300" substitute --100--.
Claim 9, last line, for "temperature" substitute
--material--.

Add the following new claims:

composite product

per E 7 10. The process of making a ^{composite product} ~~laminated-compo-~~
 C' sition that consists in applying to each of a plurality of
 per E sheets of fibrous material an adhesive ^{material} that is capable
 of being solidified by heat and pressure, superposing
 the treated sheets, applying heat and pressure to the
 superposed sheets, and then applying a greater degree of
 heat and a lower pressure.

11. The process of manufacturing insulating
 material which consists in superposing layers of coated
 insulating fabric under heat and pressure and afterward
 per E applying heat and a clamping pressure.

12. The process of manufacturing insulating
 material which consists in superposing layers of fabric
 coated with a condensation product of phenol and formal-
 dehyde under heat and pressure and afterward applying
 heat and a clamping pressure.

13. The process of manufacturing insulating
 material which consists in superposing layers of coated
 insulating fabric under heat and pressure and later apply-
 ing a greater degree of heat and a clamping pressure.

a composite product

per E 8 -14. The process of manufacturing ^{a composite product} ~~insulating~~
 material which consists in superposing layers of coated
 fabric
 " " paper, simultaneously heating and pressing the said layers
 " " of-paper, cooling the ^{material} article thus formed and then again
 " " ^{material} subjecting the article to pressure and heat. E'

Insert E 15. An insulating material formed of layers of
 per E insulating fabric and an insulating varnish superposed
 under heat and pressure and later molded under additional
 heat and pressure.

16. An insulating material molded under heat
 from a number of intimately united superposed layers of
 insulating fabric and insulating varnish.

REMARKS .

The claims have been revised in view of the Examiner's last Official action, and a group of new claims is presented herewith in order to cover more adequately the novel feature of applicant's invention, whereby a stack of coated laminations is first compacted under heat and pressure and later heated under a clamping pressure to harden the adhesive.

Claim 2 is presented for reconsideration without amendment because none of the references discloses the step of cooling laminated material under pressure. The advantage of this procedure is that there is no opportunity for the laminations to become separated while the material is hot but ^{the material} is kept under pressure until the plate is both solidified and cooled.

Claim 4 now specifies the functions of the successive applications of heat and pressure and is thereby distinguished from the references.

Claims 5, 6 and 9, in their present form, are not alternative, but are generically related, claims 6 and 9 being drawn to cover the whole range of available pressures, while claim 5 is limited to a specific portion of such pressure range.

Reconsideration of claim 7 is requested because the process of superposing successive stacks of treated laminations separated by metal plates results in economy in time and expense which is a matter of much commercial importance and which is nowhere suggested in the references. The Bakeland patent, No. 1,019,408, contains no suggestion of this process but merely shows the equivalent of a single stack of applicant's laminations clamped between pressure plates.

745,616

the foregoing amendment is believed to place
the application in condition for allowance and such
action is accordingly requested.

Respectfully,

Wesley G. Carr,

Attorney for Applicant.

Div. 15 Room 308

Address only
 "The Commissioner of Patents,
 Washington, D. C.,"
 and not any official by name.

2-250

H. D. B. G.

Paper No. 8

All communications respecting this
 application should give the serial number,
 date of filing, title of invention, and
 name of the applicant.

DEPARTMENT OF THE INTERIOR
 UNITED STATES PATENT OFFICE

WASHINGTON

Nov. 14, 1916.

MAILED

" " "

Wesley C. Carr,

P. O. Box 911,

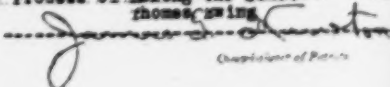
Pittsburgh, Pa.

Please find below a communication from the EXAMINER in charge of the application of

Daniel J. O'Connor, Jr., Serial No. 745,616, filed Feb. 1, 1913,

for Insulating Material and Process of Making the Same.

Thomas Swing



Commissioner of Patents

In response to the amendment filed Nov. 10, 1916:

As now advised, claims 1, 3, 5, 6, 8 and 9 may be allowed.

Claims 2, 4 and 7 are again rejected on the references of record and for the reasons before given.

Claims 10 to 16 are rejected on the same references and for the same reasons as were given in the last Office letter in considering claims 4 and 7.

Since an issue is clearly reached in the prosecution of this case, this action is made final.

Gray

W. L. Medrow,

Examiner

Div. 18, Room 308.

MAIL ROOM
FEB 9 1917
U. S. PATENT OFFICE.

Serial No. Paper No. 9
U. S. PATENT OFFICE.
FILED
FEB 9 1917
DIVISION XV.

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor Jr.,
Filed February 1, 1913,
Serial No. 745,616.

Not entered

Composite Material and
Process of Making the Same.

Pittsburgh, Pa., February 7, 1917.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:-

Acknowledging the Examiner's letter of November
14, 1916, I hereby authorize and request amendment of this
application, as follows:

Page 2, line 26, cancel "is".

Page 2, line 27, the word "microfolium" sub-
stituted for "micarta" in amendment of September 17,
1914, should be --microfolium--.

Cancel claims 2, 4, 7, 11, 12, 13, 15 and 16.

Claim 10, lines 1 and 2, for "laminated composi-
tion", substitute -- composite product--.

Claim 10, line 3, after "adhesive", insert
--material--.

Claim 14, lines 1 and 2, for "insulating material",
substitute --a composite product--.

Claim 14, line 3, for "paper", substitute -- fabric--.

Claim 14, line 4, cancel "of paper"; for "article",
substitute -- material--; cancel "then".

Claim 14, line 5, for "article", substitute
--material--.

Renumber claims 3, 5, 6, 8, 9, 10 and 14 as
claims 2, 3, 4, 5, 6, 7 and 8.

Insert the following additional claims:

D' 9. The process of manufacturing a composite product which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product, applying heat and pressure to the superposed layers, discontinuing the said heating and pressing step and subsequently applying pressure and a greater degree of heat to the product of the first heating and pressing step.

10. The process of manufacturing a composite product which consists in superposing a plurality of layers of fibrous material associated with an adhesive material that is adapted to harden under the influence of heat and pressure, applying heat and pressure to the superposed layers, discontinuing the said heating and pressing step and subsequently applying pressure and a greater degree of heat to the product of the first heating and pressing step.

11. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with an adhesive substance that is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition, and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers

of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

13. The process that comprises forming a tube of fibrous material associated with an adhesive material that is adapted to harden under the influence of heat and pressure, applying sufficient heat and pressure to partially harden the said adhesive material, and subsequently applying heat and pressure to give the tube its final shape and to completely harden the said adhesive material.

14. The process that comprises forming a tube of fibrous material associated with a phenolic condensation product, applying sufficient heat and pressure to partially harden the said condensation product, and subsequently applying heat and pressure to give the tube its final shape and to completely harden the condensation product.

15. An article composed of a plurality of superposed non-planiform molded layers of fibrous material and a phenolic condensation product compacted and hardened into a substantially homogeneous integral mass.

R E M A R K S.

While the last Office action was a final rejection, it is understood, from a discussion of the case with the Examiner, that further action will be permitted, providing such action results in placing the application in condition for allowance. It is believed that such is the effect of the present amendment, and a prompt allowance is respectfully requested.

Reconsideration of claims 7 and 8 (formerly claims 10 and 14) is respectfully requested for the reason that they do not appear to be met by the references of record from which they distinguish by the same limitations as certain of the claims that stand allowed. For instance: Claim 7 calls for two steps involving the application of heat and pressure to the superposed sheets, the second step of which involves the application of a greater degree of heat and a lower pressure than the first step. Claim 8 calls for a step of cooling the article or material between the two steps involving the application of heat and pressure. These features are not disclosed in the references and it is accordingly believed that these claims were inadvertently rejected.

New claims 9 and 10 also call for two separate and successive steps involving the application of heat and pressure, the degree of heat being greater in the final step than in the first step. This being similar to a distinguishing limitation found in some of the allowed claims, it is accordingly believed that these new claims are likewise allowable. The application of heat and pressure in two separate stages and in different degrees is a matter of great practical advantage in practicing applicant's present process, especially in the production of shaped articles by causing coated laminations of fabric to adhere in the first heating and pressing step, and giving the articles their final form in the second heating and pressing step.

New claims 11, 12 and 13 are distinguished from the patents to Jefferson, Emmett and Backeland, of record, because they call for an article of non-planiform shape in which the plurality of superposed layers of fibrous material are molded by means of a form of the proper shape. These

claims are clearly based upon the paragraph found in the middle of page 4 of the application as originally filed, and it is applicant's desire to secure the said claims by reopening the case at the present time rather than by forfeiture and renewal because the application would thereby mature into a patent at a much earlier date.

In the patent to Beekeland No. 1,019,408, which covers a process of finishing wood, there is no disclosure of the idea of molding or shaping a plurality of superposed layers of fibrous material coated with a phenolic condensation product. The most that is disclosed is the idea of embossing or producing protuberances or designs upon the surface only of the outer layer. The shaping is only of the exposed or external surface and not of the body of the article as a whole.

Applicant's process, as set forth in claims 11 and 12, is for the manufacture of articles of other than sheet or plate form, such as channel pieces or tubes of cylindrical, rectangular or other shape in cross section, and it, therefore, necessarily involves the shaping or molding of a plurality of the layers of the material rather than producing a design upon the surface of the outer layer.

The Beekeland patents fail entirely to suggest the idea of manufacturing articles of complex form by shaping or molding a plurality of layers of fibrous material, and, therefore, they should not be regarded as anticipations.

The patents to Jefferson and Emmett fail as references for the same reasons as the Beekeland patents and, in addition, for the reason that they do not disclose a phenolic condensation product employed as an adhesive or an adhesive that is adapted to harden under

the influence of heat and pressure into a substantially infusible and insoluble condition. As a result, the products of the Jefferson and Emmett processes are entirely different from applicant's product in the respect that, after completion, they may be reformed or remolded or may be disintegrated and the layers of fibrous material separated. Their articles, as a whole, are not compacted and hardened in the same sense or to the same degree as is applicant's product and they may be restored to their original condition by the application of heat or the use of proper solvents.

Claims 13 and 14 have been drawn in view of the Examiner's suggestions, made in the course of a recent oral interview, as to the wording of claims which might receive favorable consideration. These claims are distinguished from the prior art of record and are based clearly upon the disclosure of the present case, and it is requested that they be allowed with the other process claims presented herewith.

Claim 15, which is drawn to an article but which contains the same limitations as claims 11 and 12, is believed to be allowable for the same reasons as those set forth in connection with the latter claims.

Respectfully,

Wesley G. Carr

Attorney for Applicant.

Div. 15 Room 308

2-900

Paper No. 10

The Commissioner of Patents
Washington, D. C.,
and not any official by name.

G/B

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON Feb. 21, 1917.

Mailed " " "

Wesley G. Carr,

P. O. Box 911,

Pittsburgh, Pa.

Please find below a communication from the EXAMINER in charge of the application of

Daniel J. O'Connor, Jr., Serial No. 745,616, filed Feb. 1,

1913, for Insulating Material and Process of Making the Same.

James E. Hinton
Thomas Hwing, Commissioner of Patents

In response to the amendment filed Feb. 8, 1917:

The proposed amendment filed Feb. 8, 1917 has not been entered, as it is not a proper response to the final rejection of Nov. 14, 1916.

Claims 10 and 14 are held to be met by the references as are the other claims enumerated in the last Office letter.

The new claims proposed are believed to be met on the same references and for the same reasons as said claim 10, and the final action cannot, therefore, be withdrawn. They may, however, be entered for purposes of appeal, if applicant desires and so requests.

The case awaits appropriate response to the final rejection of Nov. 14, 1916.

Gray

W.L.Redrow.

Examiner

Div. 15, Room 308 Serial No.

Paper No. 11
EAPPLICATION ROOM
APR 26 1917
U.S. PATENT OFFICE.U.S. PATENT OFFICE.
F I L E D
APR 27 1917
DIVISION XV.

IN THE UNITED STATES PATENT OFFICE.

In re Application of

Daniel J. O'Connor, Jr.,

Filed Feb. 1, 1913,

Serial No. 745,616,

Composite Material and
Process of Making the Same.

-----OOO-----

Pittsburgh, Pa., Apr. 23, 1917.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:-

Acknowledging the Examiner's letter of November 14, 1916, I hereby authorize and request amendment of this application as follows:

Page 2, line 26, cancel "is".

Page 2, line 27, the word "micabolium" substituted for "micerte" in amendment of September 17, 1914, should be --micosfolium--.

Cancel claims 2, 4, 7, 11, 12, 13, 15 and 16.

Claim 10, lines 1 and 2, for "laminated composition", substitute --composite product--.

Claim 10, line 3, after "adhesive" insert --material--.

Claim 14, lines 1 and 2, for "insulating material" substitute --a composite product--.

Claim 14, line 3, for "paper" substitute --fabric--.

Claim 14, line 4, cancel "of paper"; for

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

per F 13. The process that comprises forming a tube of fibrous material associated with an adhesive material that is adapted to harden under the influence of heat and pressure, applying sufficient heat and pressure to partially harden the said adhesive material, and subsequently applying heat and pressure to give the tube its final shape and to completely harden the said adhesive material.

14. The process that comprises forming a tube of fibrous material associated with a phenolic condensation product, applying sufficient heat and pressure to partially harden the said condensation product, and subsequently applying heat and pressure to give the tube its final shape and to completely harden the condensation product.

15. An article composed of a plurality of superposed non-planiform molded layers of fibrous material and a phenolic condensation product compacted and hardened into a substantially homogeneous integral mass.

16. The process of manufacturing curved and angularly shaped articles of laminated structure that consists in preliminarily forming a planiform body of superposed flat laminations and a binder, applying sufficient heat and pressure to partially harden said binder, and then completely hardening and manipulating said body into a non-planiform contour of the desired final shape by further heat and pressure.

17. The process of manufacturing curved and angularly shaped articles of laminated structure that consists in preliminarily forming a planiform body of superposed flat laminations and a binder, applying sufficient heat and pressure to partially harden said binder, and then completely hardening and molding the preliminary planiform body into a non-planiform contour by means of a form of the desired shape through the further application of heat and pressure.

18. The process of manufacturing curved and angularly shaped articles of laminated structure that consists in preliminarily forming a planiform body of superposed flat laminations of fibrous material associated with a phenolic condensation product that is adapted to harden under heat and pressure into a substantially infusible and insoluble condition, applying sufficient heat and pressure to partially harden said phenolic condensation product, and then completely hardening and molding the preliminary planiform body into a non-planiform contour by means of a form of the desired shape through the further application of heat and pressure.

R E M A R K S .

While the last Office action was a final rejection, it is understood, from a discussion of the case with the Examiner, that further action will be permitted, providing such action results in placing the application in condition for allowance or in better condition for appeal.

Reconsideration of claims 7 and 8 (formerly claims 10 and 14) is respectfully requested for the reason

that they are distinguished from the references of record by the same limitations as certain of the claims that stand allowed. For instance, claim 7 calls for two steps involving the application of heat and pressure to the superposed sheets, the second step of which involves the application of a greater degree of heat and a lower pressure than the first step. Claim 8 calls for a step of cooling the article or material between the two steps involving the application of heat and pressure. These features are not disclosed in the references and it is accordingly believed that these claims were inadvertently rejected.

New claims 9 and 10 also call for two separate and successive steps involving the application of heat and pressure, the degree of heat being greater in the final step than in the first step. This being similar to a distinguishing limitation found in some of the allowed claims, it is accordingly believed that these new claims are likewise allowable. The application of heat and pressure in two separate stages and in different degrees is a matter of great practical advantage in practicing applicant's present process, especially in the production of shaped articles by causing coated laminations of fabric to adhere in the first heating and pressing step, and giving the articles their final form in the second heating and pressing step.

New claims 11, 12, 13, 16, 17 and 18 are distinguished from the patents to Jefferson, Remett and Beekeland, of record, because they call for an article of non-planiform shape in which the plurality of superposed layers of fibrous material are molded by means of a form

of the proper shape. These claims are clearly based upon the paragraph found in the middle of page 4 of the application as originally filed, and it is applicant's desire to secure the said claims by reopening the case at the present time rather than by forfeiture and renewal, because the application will thereby mature into a patent at a much earlier date.

In the patent to Beekeland No. 1,019,408, which covers a process of finishing wood, there is no disclosure of the idea of molding or shaping a plurality of superposed layers of fibrous material coated with a phenolic condensation product. The most that is disclosed is the idea of embossing or producing protuberances or designs upon the surface only of the outer layer. The shaping is only of the exposed or external surface and not of the body of the article as a whole.

Applicant's process, as set forth in claims 11 and 12, is for the manufacture of articles of other than sheet or plate form, such as channel pieces or tubes of cylindrical, rectangular or other shape in cross section, and it, therefore, necessarily involves the shaping or molding of a plurality of the layers of the material rather than producing a design upon the surface of the outer layer.

The Beekeland patents fail entirely to suggest the idea of manufacturing articles of complex form by shaping or molding a plurality of layers of fibrous material, and, therefore, they should not be regarded as anticipations.

The patents to Jefferson and Emmett fail as references for the same reasons as the Beekeland patents and, in addition, for the reason that they do not disclose a phenolic condensation product employed as an adhesive

or an adhesive that is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition. As a result, the products of the Jefferson and Bennett processes are entirely different from applicant's product in the respect that, after completion, they may be reformed or remolded or may be disintegrated and the layers of fibrous material separated. Their articles, as a whole, are not compacted and hardened in the same sense or to the same degree as is applicant's product and they may be restored to their original condition by the application of heat or the use of proper solvents.

Claims 13 and 14 have been drawn in view of the Examiner's suggestions, made in the course of a recent oral interview, as to the wording of claims which might receive favorable consideration. These claims are distinguished from the prior art of record and are based clearly upon the disclosure of the present case, and it is requested that they be allowed with the other process claims presented herewith.

Claim 15, which is drawn to an article but which contains the same limitations as claims 11 and 12, is believed to be allowable for the same reasons as those set forth in connection with the latter claims.

It is understood that, as a result of the several interviews which have been accorded by the Examiner in connection with this case, the Examiner is prepared to allow present claims 7 and 8, formerly numbered 10 and 14, and also claims 9 and 10 which are newly presented in this amendment. If, upon reconsideration, the Examiner is

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unable to allow new claims 11 to 18, applicant desires to take an appeal upon these claims. However, since none of the present claims which have been retained from the prior record of the case are understood to be now considered unpatentable, there are no claims in the case upon which an appeal can be taken under the rules, and it is therefore requested, in view of this peculiar circumstance, that the present amendment be entered and given a formal action, consisting either of an allowance or of such a rejection that an appeal can immediately be taken therefrom.

Respectfully,

Wesley G. Carr

B

Attorney for Applicant.

745,616-----2.

a different species, the case is not reopened. They will be entered for appeal if desired.

W L. Redrow.

Examiner

Div. 15, Room 308

MAIL ROOM
AUG 18 1917
U.S. PATENT OFFICE.

Serial No.

Paper No. 13
F

IN THE UNITED STATES PATENT OFFICE.

In re Application of

Daniel J. O'Connor, Jr.,

Filed Feb. 1, 1913,

Serial No. 745,616,

Composite Materials and
Process of Making the Same.

-----000-----

Pittsburgh, Pa., August 16, 1917.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:-

Replying to the Examiner's communication of May 14, 1917, it is respectfully requested that the amendment of April 26, 1917, be entered for the purpose of an appeal and that the following amendment be also entered for the same purpose.

Claims 1 and 2, line 3, cancel "phenol-aldehyde"
and substitute in lieu thereof --phenolic--.

Claim 9, lines 2 and 4, and claim 10, lines 2
and 6, cancel "layers" and substitute in lieu thereof
--sheets--.

Claim 9, line 6, and claim 10, line 7, after
"applying" insert --a lower--.

Cancel claims 13 to 16, inclusive.

R E M A R K S .

Claims 9 and 10, as now drawn, embody the same limitations as several of the preceding claims which stand

745,616

allowed and they are accordingly believed to be allowable. If the Examiner desires to have applicant appeal on these claims, it is respectfully requested that he be advised to that effect.

It is believed that, if the claims as now presented are carefully reconsidered by the Examiner, he will not desire to have applicant appeal, although the present amendment is intended to place the application in condition for appeal.

Respectfully,

Wesley G. Carr

Attorney for Applicant.

DOCKET CLERK
AUG 18 1917
U.S.PATENT OFFICE.

Serial No. 745,616 Paper No. 14

ck \$10- REC'D
AUG 18 1917 C.
C.C.U.S.PAT.OFFICE.

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor, Jr.,
Filed Feb. 1, 1913,
Serial No. 745,616,
Composite Material and
Process of Making the Same.

-----OO-----

Pittsburgh, Pa., August 16,

Hon. Commissioner of Patents.

Washington, D.C.

Sir:-

Appeal is hereby taken to the Board of Examiners-in-Chief from the action of the Primary Examiner in finally rejecting claims 11 and 12 of the above-entitled application.

The grounds for this appeal are as follows:

1. That the Examiner erred in holding that the appealed claims are not by the references of record or by any of such references.
2. That the Examiner erred in finally rejecting the appealed claims.
3. That the Examiner erred in not allowing the appealed claims,
4. A check for ten dollars (\$10.) for the appeal fee is enclosed herewith.

Respectfully.

Wesley G. Carr

Attorney for Appellant.

Div. 15 Room 308

R04/LDH

2-200

Paper No. 15

Address only
 "The Commissioner of Patents,
 Washington, D. C.,"
 and not any official by name.

All communications respecting this
 application should give the serial number,
 date of filing, title of invention, and
 name of the applicant.

DEPARTMENT OF THE INTERIOR
 UNITED STATES PATENT OFFICE

WASHINGTON

Aug. 30, 1917.

Mailed " " "

Wesley G. Carr,

P. O. Box 911,

Pittsburg, Pa.

Please find below a communication from the EXAMINER in charge of the application of

Daniel J. O'Connor, Jr., Ser. No. 745,616, filed Feb. 1, 1913;

Insulating Material and Process of Making the Same.

R. F. Whitshed, Acting Commissioner of Patents.

THOMAS - Sales

If the proposed amendment presented Aug. 18, 1917, were entered, there would then be twelve claims remaining in the case, of which only six - those recited in the office letter of Nov. 14, 1916, giving the final action, have been allowed.

The other six claims stand therefore under the final rejection and appeal should be taken on all of them unless certain of them are canceled.

The appeal as to Claims 11 and 12 only will not be forwarded therefore and the case awaits proper response to the final rejection of Nov. 14, 1916.

The recent proposed amendment has not been entered.

Gray

G.V. Chandler

Act. Exr.

Div. 15, Room 308.
MAIL ROOM
SEP 7 1917
U. S. PATENT OFFICE.

Serial No. Paper No. 16
U. S. PATENT OFFICE,
FILED
SEP 8 1917
DIVISION XV.

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor Jr.,
Filed February 1, 1913,
Serial No. 745,616,
Composite Material & Process
of Making the Same.

-X-X-X-X-X

Pittsburgh, Pa., September 6, 1917.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:-

Acknowledging the Examiner's letter of August 30, 1917, applicant is quite surprised at the action taken for the reason that claims 7, 8, 9 and 10 of the claims that would remain in the case if the amendments of April 26, 1917, and August 18, 1917, were entered are clearly allowable because they embody the same limitations as certain of the claims that stand allowed, and also for the reason that during several interviews with the Examiner no objection was raised to the patentability of these claims. In fact, it appears that claims 7 and 8 must have been inadvertently rejected in the final rejection of November 14, 1916. Claims 9 and 10 have been inserted since the final rejection but, as above stated, should be allowable for the same reasons as certain of the claims that now stand allowed.

Applicant, of course, appreciates the technical correctness of the Examiner's position in requiring either

745,616

cancellation of, or an appeal with respect to, claims 7 to 10, inclusive, but he cannot understand what real purpose there would be in requiring that such action be taken. Certainly the Examiner does not wish to require cancellation of, or an appeal with respect to, claims the patentability of which he has substantially admitted by allowance of other claims embodying the same distinguishing limitations.

Under the circumstances, applicant suggests and requests that the Examiner enter the amendments of April 26, 1917, and August 18, 1917, and further that he allow claims 7 to 10, inclusive, in order that the appeal may be prosecuted with respect only to subject-matter which is really in controversy.

Of course, if applicant has misunderstood the Examiner's position with respect to claims 7 to 10, inclusive, and ^{if he} has valid reasons for not allowing the said claims, and especially claims 7 and 8, it is respectfully requested that such position and reasons be made clear in order that the requirement of the second paragraph of the Office action of August 30, 1917, may be complied with after a full understanding of the Examiner's view-point.

By means of formal actions and interviews every effort has been exerted on behalf of applicant to arrive at a clear understanding of the Examiner's position and view-point in this case, in order either to avoid appeal or to have the issue on appeal clearly defined. The position of the Office has never been clear and consistent, especially because of the failure to allow claims 7 and 8, and the latest action of the Office still leaves the questions at issue confused and uncertain.

745,616

Will not the Examiner please clear up the situation in order that applicant may proceed with his appeal with respect only to the subject-matter which seems to be really at issue?

Respectfully,

Wesley G. Carr,
S.

Attorney for Applicant.

Department of the Interior,

UNITED STATES PATENT OFFICE.

Washington, D. C., Sept. 21, 1917.

U. S. PATENT OFFICE,
SEP 21 1917
MAILER D.

In re application of :
 Daniel J. O'Connor, Jr.,)
 Ser. No. 745,616, : Before the
 Filed Feb. 1, 1913,) Examiners-in-Chief
 For Insulating Material : on Appeal.
 & Process of Making Same.)

Examiner's Statement.

Applicant appeals on the rejection of claims 11
and 12.

11. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with an adhesive substance that is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition, and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

The reference applied is

Bakeland, 1,019,408, Mar. 5, 1912.

The process involved in these two claims merely consists in uniting a plurality of sheets of fibrous material (paper or textile fabric) by means of bakelite or similar adhesive by heat and compression to consolidate and also shape, at the same time, the composite sheet. It is the Examiner's opinion that the second column, page 2 of Bakeland discloses the adhesion and shaping of a plural-

-2-

ity of layers, veneering and a backing asbestos board or fabric (line 74) by means of bakelite under pressure and heat. The clause, lines 88 to 90, is taken to mean that the pannel as a whole is shaped or embossed throughout its thickness, including the veneering and backing, with the desired design. It is not apperent that these claims include any features not disclosed by this reference.

very respectfully,

W. L. Redrow,
Examiner, Div. 15.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON

Sept. 24 , 1917.

Sir:

The case of Daniel J. O'Connor, Jr.

Serial } No. 745,616 , will be heard by the { Commissioner-
 Intf. } Examiners-in-Chief
 on the 6 day of December 1917.

It is the case on the assignment for that day.

The hearings will commence at {ten } o'clock, and as soon as
 {one }
 the argument in one case is concluded the succeeding case will
 be taken up.

If any party, or his attorney, shall not appear when the
 case is called, his right to an oral hearing will be regarded
 as waived.

The time allowed for arguments is as follows:

Ex parte cases, thirty minutes;
 Motions, thirty minutes, each side;
 Interference appeals, final hearing, one hour each side.

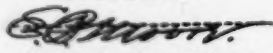
By special leave, obtained before the argument is commenced,
 the time may be extended.

The appellant shall have the right to open and conclude in
 interference cases, and in such case a full and fair opening
 must be made.

Briefs in interference appeals must be filed in accordance
 with the provisions of Rule 147.

Respectfully,

J. T. Newton.



Commissioner of Patents.

To

To Wesley G. Carr, Esq.,
 P. O. Box 911,
 Pittsburgh, Pa.

EXAMINERS IN CHIEF
DEC 6 1917
U.S. PATENT OFFICE

Appeal No. 1967

Paper No. 19

Brief.

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor Jr.,
Serial No. 745,616,
Filed February 1, 1913.
Insulating Material and
Process of Making Same.

~~EXAMINERS~~

BEFORE THE EXAMINERS-IN-CHIEF

ON APPEAL.

BRIEF FOR APPLICANT.

This is an appeal from the final rejection by
the Primary Examiner of the following claims:

11. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with an adhesive substance that is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition, and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

The reference relied upon by the Examiner is
Bakeland et al. patent No. 1,019,408, March 5, 1912.

The subject-matter of the appealed claims is a process of manufacturing molded articles by the use of sheets or layers of paper, cloth, or similar fibrous material and an adhesive substance, such as Bakelite, that is adapted to harden under the influence of heat and pressure

into a hard, insoluble and infusible condition. As usually practiced, the process consists in first coating the layers of fibrous material with Bakelite and then superposing them, whereupon they are placed in molds and compressed and heated until the Bakelite has set and hardened and the layers are thoroughly cemented together. The process is adapted to the manufacture of such articles as insulating tubes of rectangular, hexagonal or other desired cross-section, and of channels and other structural shapes, and also of other articles of irregular contour.

A great variety of articles of substantially any desired shape have heretofore been manufactured by the use of a mixture of Bakelite and a suitable fibrous filler, such as shredded or comminuted asbestos and wood fiber. However, when thin-walled articles are made by the use of these materials, they are not only too fragile for most practical uses but they are also often imperfect because of the difficulty of distributing the materials uniformly in all parts of the molds.

The present process is especially adapted to the manufacture of articles having thin walls and in which uniformity and a high degree of strength and quality are required sometimes for mechanical and sometimes for electrical reasons, but more often for both reasons. The process has been used since prior to the filing of the application in the manufacture of innumerable commercial articles and produces results, and has possibilities, that cannot be approached by the prior art processes of molding with mixtures of Bakelite and shredded fillers.

The patent to Bakeland, et al., No. 1,019,408, upon which the Examiner relies, discloses a process of applying a coating of Bakelite to the surface of wood or like fibrous or cellular materials to produce a hard, smooth, ornamental finish or surface that is resistant to the effects of moisture and chemical action. In some cases a veneering of wood is also applied to the article, in which event the Bakelite may be used not only for a surface finish but also to cement the veneering to the base or support. However, the prime idea in both cases is that the material or article should have a surface coating of Bakelite which may be given any desired finish, design, shape, or configuration by embossing or otherwise.

The final rejection is based principally upon lines 86 to 90 of page 2 of the specification, which are as follows:

"In the case of ceilings or panels, the ornamental effect may be increased by imparting, during the act of finishing, any desired design or shape by embossing or otherwise."

The Examiner has taken this sentence to mean "that the panel, as a whole, is shaped or embossed throughout its thickness, including the veneering and backing, with the desired design".

There are many reasons for applicant's believing that the Examiner is in error in this contention. In the first place, the whole tenor of the patent, including the specification, the drawing and the claims, is that the ornamental effect is upon the surface only and that only the thin surface coating of Bakelite is affected by the embossing or other shaping operation.

For instance, consider the following quoted portions of the specification.

Page 1, lines 9 to 15:

"This invention relates to the production of articles consisting of or surfaced with wood or like fibrous or cellular materials to which is applied a coating of a condensation product."

Page 1, lines 32 to 40:

"According to the present invention, there may be produced upon wood, or like fibrous or cellular bodies, in a few minutes and by a single operation, a finished coat which may be of any desired character or degree of brilliancy, and which is harder, more durable, and more resistant to the effects of moisture and chemicals than any coat or finish heretofore used."

Page 1, lines 60 to 65:

"According to the present invention, there may be applied to the surface of the wood an initial condensation product of the above type."

Page 1, lines 81 to 86:

"The surface of the wood to be finished, assuming that a brilliant finish is desired, is then pressed against a perfectly smooth and hard surface, preferably a sheet of metal, as, for example, steel or brass properly polished and provided with a thin plating of nickel."

Page 2, lines 6 to 15:

"It is possible in a few minutes to provide a wooden surface with a color and finish which could heretofore be secured only at great expenditure of time and labor. Furthermore, the thin layer of the infusible and insoluble condensation product forms a hard surface which cannot be scratched by the nail, and which is capable of withstanding water, steam, alcohol and most chemicals."

Page 2, lines 31 to 40:

"The soft wood is impregnated with the initial condensation product in any of the ways above described, and during the act of finishing is compressed in such manner as to increase its density while, at the same time, imparting to it a surface polish or finish and any desired shape or configuration. The coating material may in all cases be colored as desired by the addition of dyes or pigments."

Page 2, lines 41 to 51:

"A highly advantageous embodiment of the process consists in coating veneer by dipping or otherwise with the initial condensation products or the materials

that can engender them, and then applying the coated veneer to a wooden or other base, the condensation products serving not only as a finishing material for the exposed surface of the veneer but attaching the veneer in a far more effective manner than is possible with glue."

Page 2, lines 70 to 82:

"In the same way, a veneer or surface of wood can be applied to metallic or other bases, as for example, to steel, or aluminum plates, asbestos board or fabric, cement, stone or other incombustible supporting bodies. These non-combustible substances are thereby covered with a highly ornamental thin coating of veneer, forming articles which while possessing the appearance of highly ornamental wood are incombustible, far stronger and more durable than wood, and subject to none of its disadvantages."

Page 2, lines 122 to 128:

"The methods herein described are also applicable for finishing and imparting a durable and brilliant surface to materials having the essential characteristics, for the purposes of this invention, of wood, such, for example as cardboard, pulpboard, paper or like fibrous or cellular bodies."

Page 3, lines 13 to 19:

"In Fig. 2 the parts above described are illustrated as assembled upon a suitable support 5 and subjected thereon to pressure exerted between this support and the heated plate 6, having such finish as it is desired to impart to the surface of the completed article."
(Underlining in all cases mine).

Particular attention is directed to the underscored portion of the immediately preceding quotation, which shows clearly that the patentees had in mind shaping only the surface layer of Bakelite by engraving or otherwise finishing the surface of but one platen: i.e., only the one that is pressed against the Bakelite. This is the portion of the specification that describes the apparatus by means of which the process is practiced, and is most illuminating as to the intentions of the patentees.

Moreover, claims 1 and 2 specify that the Bakelite-coated surface is pressed "against a surface having

the desired finish", showing still further that any design or configuration imparted to the article is produced only in the surface layer of Bakelite.

Furthermore, the sentence in the specification upon which the Examiner relies chiefly should be read in connection with the preceding sentence, which is, as follows:

"Ceiling or wainscoting panels, parquet flooring, and like articles, can be made by applying a thin coat of wood or veneer on any desired support or base."

It should also be considered in connection with the context of the specification, as above outlined, and with the drawing which shows a relatively thick and rigid base or support which could not be embossed in the manner suggested by the Examiner.

In fact, there appears to be but one logical, reasonable inference to be drawn from the patent, and that is that the patentee intended to emboss only the surface layer of Bakelite, especially because they show and describe apparatus intended and adapted to produce only such a result.

The shaping of only the surface layer composed of Bakelite applied to a relatively rigid base, by impressing the surface with a platen or die having an ornamental design engraved upon it, is a very different matter from shaping or molding a complete or entire article composed of a plurality of layers of thin pliable, fibrous material that are associated with an adhesive substance, as in applicant's process.

In this connection, it should be noted that the appealed claims call for superposing a plurality of layers of fibrous material, and molding the plurality of superposed

layers by means of a form of the proper shape. They also specify that the article is non-planiform.

The reference does not contain the slightest suggestion of such a process and it is believed that it would not have occurred to the Examiner to read or construe the patent as suggesting the shaping of the entire body of an article composed of a plurality of layers of fibrous material and Bakelite if it had not been first suggested to him by the present application.

The present process has proved to be of great practical value and utility in the manufacture of a large variety of non-planiform articles which could not be made by the process of the patent or by any process suggested by it, and it is, accordingly, respectfully submitted that the Examiner should be reversed and that the appealed claims should be allowed.

Respectfully submitted,

Wesley G. Carr

Attorney for Applicant.

MAIL ROOM
DEC 12 1917
U.S. PATENT OFFICE

Appeal No. 1967 Paper No. 20

DOCKET CLERK
DEC 13 1917
U.S. PATENT OFFICE

Supplemental Brief.
EXAMINERS IN CHIEF
DEC 14 1917
U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE.

In re Application of
Daniel J. O'Connor, Jr.,
Serial No. 745,616,
Filed February 1, 1913,
Insulating Material and
Process of Making Same.

BEFORE THE EXAMINERS-IN-CHIEF ON APPEAL.

SUPPLEMENTAL BRIEF FOR APPLICANT.

This supplemental brief is presented in view of the discussion which occurred during the argument at the hearing on December 6, 1917, during which applicant's attorney was advised that a recommendation would probably be made for the allowance of the appealed claims if amended to specify that the Bakelite or adhesive substance is placed between the layers of fibrous material.

Such a limitation was suggested to distinguish from an article which might be merely coated upon its external surface with Bakelite or a similar adhesive substance.

Accordingly, the following claims are presented in the belief that they embody the distinction suggested by the Board of Examiners-in-Chief:

11. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material interspersed with an adhesive substance that is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition, and molding the super-

posed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material interspersed with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

The above claims differ from the appealed claims only by the substitution of the word 'interspersed' in the third line of each claim for the word 'associated'.

The above claims are offered as substitutes for the appealed claims.

Respectfully submitted,

Wesley G. Carr

Attorney for Applicant.

Decision.

Hearing:
December 6, 1917.

Appeal No. 1967. U.S. Patent Office. March 29, 1918.

Before the Examiners-in-Chief, on Appeal.

Application of Daniel J. O'Connor, Jr., for a patent for an improvement in Insulating Material and Process of Making the Same, filed February 1, 1913, Serial No. 745,616.

Mr. Wesley G. Carr, attorney for appellant.

This is an appeal from the action of the primary examiner finally rejecting the following claims:

11. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with an adhesive substance that is adapted to harden under the influence of heat and pressure into a substantially infusible and insoluble condition, and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

12. The process of manufacturing a non-planiform article which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

The reference relied upon is:

Backeland, et al, 1,019,408, Mar. 5, 1912.

The ground of rejection is that the reference discloses the exact process that is set forth in the appealed claims. The examiner calls attention to lines 86 to 90, inclusive, page 2, which he takes to mean that the panel there referred to is shaped or embossed as a whole throughout its thickness, including the veneering and backing, with the desired design.

#1967--2.

In our opinion this interpretation is not warranted. While it is conceivable that the patentee had such an operation in mind, it is more likely that he referred to the pressing of the surface coat of veneer upon a previously shaped backing or to the molding of a shallow design in the surface of the veneer only. We think that it is very doubtful whether those skilled in the art would have suggested to them by this reference the process which the applicant is claiming. The appealed claims are therefore deemed allowable. In a supplementary brief, the applicant offers substitute claims drawn in view of a discussion which took place at the hearing. These claims do not, in our opinion, necessarily mean any more than do the appealed claims. The word "interspersed" in the proposed claims, in our opinion, is no better than the word "associated" in the appealed claims. We therefore do not recommend the admission of the proposed claims.

The action of the primary examiner is reversed.

Fairfax Bayard

S. E. Fouts

E. S. Henry

Examiners-in-Chief.

2-302

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON

Appeal No. 1967 Paper No. 22

Notice of Decision.

EXAMINERS IN CHIEF

MAR 29 1919

U.S. PATENT OFFICE

Sir:

Inclosed find copy of decision this day rendered by the

Examiners in Chief in the

	ex parte	
	interference	

 case of

Daniel J. O'Connor, Jr., Serial No. 745,616.

By direction of the Commissioner:

Very respectfully,

W. F. Woolard,

Chief Clerk.

Mr. Wesley G. Carr,

P. O. Box 911,

Pittsburgh, Pa.

Div. 15... Room 308

Address only
The Commissioner of Patents,
Washington, D. C.,
and not any official by name.

E-284

Paper No. 25

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON

Apr. 8, 1918

Mailed

EXAMINER'S AMENDMENT.

W W W

Wesley O CarrPost office Box 911Pittsburgh, Pa.

Please find below a communication from the EXAMINER in charge of the application of

Daniel J. O'Connor, Jr. Ser. No. 745,616, filed Feb. 1, 1913;

Insulating Material and Process of Making the Same.

James S. Houston
Commissioner of Patents.

In accordance with the provisions of Order No. 2308, dated March 12, 1917, which reads in part as follows:

Obvious informalities in the application may be corrected by the examiner, but said correction must be in the form of an amendment, approved by the Principal Examiner in writing, placed in the file, and made a part of the record. The changes specified in the amendment will be entered by the clerk in the regular way.

The changes, hereinafter specified, are made by the examiner in the application above identified. Should these changes not be satisfactory to the applicant, appropriate amendment may be prepared under the provisions of Rule 78, provided the specification has not been printed. The application has been amended as follows:

Correct the title in the preamble to

Process of Making Composite Material.

Page 2 cancel from including "relates" line 1 to
including "it" line 2.

W. L. Redrow

Examiner.

Copy sent applicant.

ADMITTED ONLY
THE COMMISSIONER OF PATENTS,
WASHINGTON, D. C.

S-121

Serial No. 745,616.

X.O'D.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON

April 18, 1918.

Daniel J. O'Connor, Jr., Assoc.

Sir: Your APPLICATION for a patent for an IMPROVEMENT in
Process of Making Composite Material,

filed Feb. 1, 1915, has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of \$15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

J. T. Newton

Thomas J. Newton
Commissioner of Patents.

Wesley G. Carr.

P. O. Box 911, Pittsburg, Pa.

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

257-258

\$20 REC'D
OCT 16 1918
C.C.U.S.PAT.OFFICE

MEMORANDUM
OF
FEE PAID AT UNITED STATES PATENT OFFICE

Serial No. 745,616

INVENTOR: Daniel J. O'Connor Jr.,

PATENT TO BE ISSUED TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

NAME OF INVENTION, AS ALLOWED: Composite Material & Process of
Making the Same.

DATE OF PAYMENT: October 16, 1918.

FEE: FINAL FEE OF \$20.00.

DATE OF FILING: February 1, 1913.

DATE OF CIRCULAR OF ALLOWANCE: April 16, 1918.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

WESLEY G. CARR,

Attorney.

SEND PATENT TO

WESLEY G. CARR,

Westinghouse Electric & Manufacturing Co.,

East Pittsburgh, Pa.

[fol. 259]

IN UNITED STATES DISTRICT COURT

OPINION OF DISTRICT COURT—Filed October 6, 1921

PECK, District Judge: This is an action for an injunction against infringement of patent No. 1,284,432, issued to Daniel J. O'Connor, Jr., November 12, 1918, on an application filed February 1, 1913, for the process of making a composite material such as card-board, by building up laminations of paper or cloth and a phenolic condensation product and hardening the same under pressure and heat. Claims 11 and 12 are the ones in issue, and cover the process of making non-planiform articles of that material by moulding. Certain other patents were declared upon, but plaintiff withdrew them from the suit at the trial. The answer denies both infringement and validity.

It is claimed that the plaintiff is estopped by laches to maintain this action. A brief chronology of events is necessary to a consideration of this defense.

On February 1, 1913, Daniel J. O'Connor, Jr., now vice-president of the defendant corporation, then an employee of the Westinghouse Company, plaintiff, made an application for the patent in suit, which did not include claims 11 and 12 but did include others which were broader. At the same time he assigned the invention and right to letters patent to the plaintiff. Thereafter the plaintiff had complete control of the prosecution of the application. O'Connor left the company and participated no further in it. On September 17, 1913, all claims were rejected by the Patent Office. A year later, September 15, 1914, the claims were amended, and rejected upon November 7th of the same year. Again a year passed, and on October 23, 1915, the claims were again amended, and rejected in part November 13, 1915. On the eve of the passing of another year, November 8, 1916, further amendments were filed, and upon November 14th of that year again certain of the claims were allowed and others rejected. Upon February 8, 1917, amendments were filed, [fol. 260] including for the first time claims for the process of making, specifically, non-planiform articles by moulding under heat and pressure, although claims broad enough to cover it had been presented by the several prior amendments. These were the originals of claims 11 and 12 in suit. They were rejected February 21, 1917, and after further amendments and an appeal, were allowed by a decision of the Board of Examiners in Chief rendered March 29, 1918. The patent issued November 12th of that year. In the meantime, about the middle of March, 1913, H. A. Faber, founder and now president of the defendant company, then a mechanical engineer in the employ of the plaintiff, left that company for the avowed purpose of going into the business of making products such as those now in controversy. Shortly after that he was joined by O'Connor. They went into partnership, together with a man named Tomlin, who furnished the capital for the enterprise, and at once began the manufacture of non-planiform and moulded articles, which

would have responded to claims 11 and 12 had those claims been then in existence. They did this openly and publicly. They described their product in a leaflet, a copy of which came into the possession of the defendant company. H. A. Faber also discussed the product with the head of the department of the Westinghouse Company under whom he had been shortly theretofore serving. The partners subsequently incorporated their enterprise into the defendant corporation, which has steadily continued the manufacture of the articles in question up to the present time. No protest against the proposed manufacture was made by the Westinghouse Company, nor was any objection made by it to the alleged infringement involved in this suit until shortly before the same was instituted and at a time when difficulties had arisen between the two companies concerning the alleged infringement of another patent relating to bakelite gears.

It is true that the issue of laches is not raised by the answer, but that is not necessary, as it may be raised at the hearing. *Hays vs. [fol. 261] Port of Seattle*, 251 U. S., 233. In *Sullivan vs. The Portland & Kennebec R. R. Co.*, 94 U. S., 806, at page 811, it is said: "To let in the defence that the claim is stale, and that the bill cannot, therefore, be supported, it is not necessary that a foundation shall be laid by any averment in the answer of the defendants. If the case, as it appears at the hearing, is liable to the objection by reason of the laches of the complainants, the court will, upon that ground, be passive, and refuse relief."

When one has knowledge of his rights and an ample opportunity to establish them in the proper forum, and by reason of his delay the adverse party has good reason to believe that the alleged rights are worthless or have been abandoned, and when, because of the change in condition or relations during this period of delay, it would be an injustice to the latter to permit the former to assert them, equitable relief should be denied upon the ground of laches. *Gallihier vs. Cadwell*, 145 U. S., 368, 372.

It will be noticed that the plaintiff kept its application alive for three years by filing an amendment a few days before the expiration of each year, the time limit, until November 14, 1916. Thereafter two years ensued before the patent issued. During practically all this time it had knowledge that the defendants were engaging in the business of manufacturing the articles now said to infringe. The full six months' time allowed by the rules for the payment of the final fee after the allowance of the claims seems to have been taken, and after the patent issued this action was not brought for a period of more than two years, and then in conjunction with intimations of reprisal for resistance offered by defendants with regard to another patent. Thus the plaintiff, by pursuing dilatory tactics in the Patent Office for the first three years, and by abstaining from suit or protest for two years after the patent was issued, permitted the defendant to invade its alleged rights for a period in all of more than seven years.

[fol. 262] The plaintiff's claim is obviously stale. Having kept its application hanging, by annual amendments, in the Patent

Office while it was aware that defendant was endeavoring to build up a business in articles now alleged to infringe, and having waited for more than two years after the issuance of the patent, it asks the aid of equity to suppress that which, by long-continued silent acquiescence, it has permitted another, by the expenditure of energy and money, to create. Under such circumstances its prayer should not be granted. It is unnecessary to determine the other points in issue. The bill must, for the reason stated, be dismissed.

IN UNITED STATES DISTRICT COURT

FINAL DECREE—Filed November 1, 1921

This cause having come on to be heard at this term and having been argued by counsel for the respective parties, now upon due consideration thereof, it is

Ordered, adjudged and decreed that the bill of complaint herein be, and it hereby is, dismissed with costs to the defendant to be taxed.
Peck, United States District Judge.

Approved as to form: Kerr, Page, Cooper & Hayward, Solicitors for Plaintiff. Dyrenforth, Lee, Chritton & Wiles, Solicitors for Defendant.

[fol. 263] IN UNITED STATES DISTRICT COURT

PETITION OF APPEAL—Filed March 11, 1922

The plaintiff, Westinghouse Electric & Manufacturing Company, conceiving itself aggrieved by the final decree made and entered herein on or about the 1st day of November, 1921, dismissing the bill of complaint, does hereby appeal from the said decree to the United States Circuit Court of Appeals for the Sixth Circuit, for the reasons specified in the assignment of errors which is filed herewith; and it prays that this appeal may be allowed and a citation granted directed to the defendant, The Formica Insulation Company, commanding it to appear before the said United States Circuit Court of Appeals for the Sixth Circuit, to do and receive what may appertain to justice in the premises; and that a transcript of the record, proceedings and papers upon which said decree was made may be duly authenticated and sent to the said United States Circuit Court of Appeals for the Sixth Circuit.

Westinghouse Electric & Manufacturing Company, By John C. Kerr, Alfred Allen. Dated, March 11th, 1922.

IN UNITED STATES DISTRICT COURT

ALLOWANCE OF APPEAL—Filed March 11, 1922

The foregoing petition of appeal is allowed and the appeal cost bond is fixed in the sum of Two hundred and fifty Dollars (\$250.00) to be approved by the court.

J. E. Peck, United States District Judge. March 11th, 1922.

[fol. 264]

IN UNITED STATES DISTRICT COURT

ASSIGNMENT OF ERRORS—Filed March 11, 1922

The plaintiff, Westinghouse Electric & Manufacturing Company, conceiving itself aggrieved by the final decree entered herein on or about the 1st day of November, 1921, now appears by its counsel and presents, with the accompanying petition of appeal from the said decree, the following assignment of errors:

First. The Court erred in dismissing the bill of complaint.

Second. The Court erred in not granting the relief prayed for in the bill of complaint.

Third. The Court erred in holding that the plaintiff is estopped by laches to maintain this action.

Fourth. The Court erred in holding that the plaintiff's claim is stale.

Fifth. The Court erred in not holding that claim 11 of the patent in suit No. 1,284,432 is valid as against the defendant herein.

Sixth. The Court erred in not holding that claim 12 of the patent in suit No. 1,284,432 is valid as against the defendant herein.

Seventh. The Court erred in not holding that the defendant had infringed upon claim 11 of the said patent in suit.

Eighth. The Court erred in not holding that the defendant had infringed upon claim 12 of the said patent in suit.

Ninth. The Court erred in not holding that the defendant was estopped to deny the validity of the patent in suit.

John C. Kerr, Alfred M. Allen, Counsel for Plaintiff. March 11th, 1922.

[fol. 265] IN UNITED STATES DISTRICT COURT

CITATION—Filed March 11, 1922; omitted in printing

Service of the foregoing Citation is hereby acknowledged this 11th day of March, 1922.

Dyrenforth, Lee, Chritton & Wiles, Solicitors for the Formica Insulation Company.

[fol. 266] IN UNITED STATES DISTRICT COURT

PRÆCIPE—Filed March 11, 1922

To the Clerk of the District Court of the United States for the Southern District of Ohio, Western Division.

SIR: You are hereby requested to certify the transcript of record to be filed in the United States Circuit Court of Appeals for the Sixth Circuit, pursuant to an appeal allowed to the plaintiff in the above entitled case, and to include in said transcript of record the following material, viz.:

1. Bill of complaint.
2. Defendant's answer.
3. Plaintiff's testimony, D. J. O'Connor, Jr., witness.
4. Defendant's testimony, Herbert A. Faber and D. J. O'Connor, Jr., witnesses.

5. Plaintiff's Exhibits, as follows:

No. 1, O'Connor patent in suit No. 1,284,432.

6. Defendant's Exhibits, as follows:

No. 1, Prior art patent.

United States Patents:

No.	159,494,	Feb.	9,	1875,	Brock.
"	176,481,	Apr.	25,	1876,	Richardson.
"	229,296,	June	29,	1880,	Young.
"	262,257,	Aug.	8,	1882,	Taylor.
"	269,816,	Dec.	26,	1882,	Hamilton.

[fol. 267]

No.	327,286,	Sep.	29,	1885,	Loewenthal.
"	342,377,	May	25,	1886,	Nenninger.
"	348,593,	Sep.	7,	1886,	Spurr.
"	491,708,	Feb.	14,	1893,	Jefferson.
"	508,653,	Nov.	14,	1893,	Thomson.

No.	613,674,	Nov.	8,	1898,	Grant.
"	691,871,	Jan.	28,	1902,	Raphael.
"	700,656,	May	20,	1902,	Kempshall.
"	734,888,	July	28,	1903,	Kingzett.
"	803,816,	Nov.	7,	1905,	Emmet.
"	840,401,	Jan.	1,	1907,	Upton.
"	858,384,	July	2,	1907,	Haefely.
"	939,966,	Nov.	16,	1909,	Baekeland.
"	941,605,	Nov.	30,	1909,	"
"	942,699,	Dec.	7,	1909,	"
"	942,809,	Dec.	7,	1909,	"
"	949,671,	Feb.	15,	1910,	"
"	954,666,	Apr.	12,	1910,	"
"	966,873,	Aug.	19,	1910,	Towne.
"	1,009,752,	Nov.	28,	1911,	Huebner.
"	1,019,406,	Mar.	5,	1912,	Baekeland.
"	1,019,408,	Mar.	5,	1912,	" & Thurlow
"	1,028,108,	June	4,	1912,	Haefely.
"	1,077,113,	Oct.	28,	1913,	Aylsworth.
"	1,160,364,	Nov.	16,	1915,	Baekeland.
"	1,233,298,	July	17,	1917,	"

British Patent No. 25,489, of 1899, Wicks.

No. 2. File wrapper and contents O'Connor patent 1,284,432.

7. Opinion of Judge Peck in District Court.

8. Final decree.

[fol. 268] 9. Petition of appeal and allowance of same.

10. Assignment of errors.

11. Citation.

12. Appeal Bond for \$250.

13. The Præcipe.

14. Certificate of Clerk of U. S. District Court.

John C. Kerr, Alfred M. Allen, Counsel for Plaintiff.
March 11th, 1922.

We hereby acknowledge service this 11th day of March, 1922, of the foregoing Petition and Allowance of Appeal, Assignment of Errors and Præcipe, and agree that the record on appeal herein shall be made up in accordance with said Præcipe.

Dyrenforth, Lee, Chritton & Wiles, Solicitors for Defendant.

[fol. 269] Proceedings in the United States Circuit Court of Appeals for the Sixth Circuit

APPEARANCE OF COUNSEL—Filed April 8, 1922

Arthur B. Mussman, Clerk of said Court:

Please enter my appearance as counsel for the Appellant.

Cooper, Kerr & Dunham, Allen & Allen, John C. Kerr, Alfred M. Allen.

APPEARANCE OF COUNSEL—Filed April 8, 1922

To the Clerk of the Court:

Please enter appearances for the appellee as follows: John H. Lee, J. Edgar Bull, Dyrenforth, Lee, Chritton & Wiles, Wood & Wood.

Respectfully, Dyrenforth, Lee, Chritton & Wiles. Chicago, April 5, 1922.

[fol. 270] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT

CAUSE ARGUED AND SUBMITTED

(December 13, 1922—Before Knappen, Denison, and Donahue, C. JJ.)

This cause is argued by Mr. Alfred M. Allen for the appellant and by Mr. J. Edgar Bull and Mr. John H. Lee for the appellee and is submitted to the Court.

UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT

DECREE—Filed April 3, 1923

Appeal from the District Court of the United States for the Southern District of Ohio

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Southern District of Ohio and was argued by counsel.

On Consideration Whereof, it is now here ordered, adjudged and decreed by this Court, that the decree of the said District Court in this cause be and the same is hereby affirmed with costs.

UNITED STATES CIRCUIT COURT OF APPEALS, SIXTH CIRCUIT

[Title omitted]

Before Knappen, Denison, and Donahue, Circuit Judges

OPINION—Filed Apr. 3, 1923

DENISON, Circuit Judge: The appellant brought in the District Court the usual infringement suit upon claims 11 and 12 of patent No. 1284432, issued November 12, 1918, to O'Connor, on an application filed February 1, 1913, covering a process for making composite materials. The two claims are alike save that claim 12 calls for "a phenolic condensation product," while claim 11 more broadly reaches in the same association any suitable adhesive substance. Claim 12 is given in the margin.¹

In the court below the defenses were that these claims were invalid, or that if valid, they must be so narrowly construed that there [fol. 272] was no infringement, and that there had been laches sufficient to bar the maintenance of the suit.

In reply plaintiff urged that the broad construction indicating infringement was the right one and that the defendant was estopped to dispute validity. The District Court sustained the defense of laches, and the other questions were not passed upon.

We cannot uphold this defense. The suit was commenced within two years after the patent issued, when, if ever, plaintiff first acquired any right or cause of action, and there is no suggestion that defendant changed its position during that period. Even that delay is explained by the pendency of another suit between the same parties, directed against the same product, and which, if successful, would have made this suit probably unnecessary. Defendant's real complaint goes further back. It or its predecessors began the infringing business in 1913, and continued it, with the knowledge of the plaintiff and without express notice to desist, from that time until this suit was brought in 1920. During this period defendant built up a large business and doubtless made large investments, based in a substantial degree upon the manufacture of the infringing articles and the expectation of continuing that manufacture. The application, as filed in 1913, was repeatedly rejected and amended, and was prosecuted with reasonable diligence during the last two years, but for the first three years of the application period, the plaintiff was only as diligent as the law required, and delayed its successive actions for the full period. It is, hence, probably true that the application was pending two or three years longer than it would have been if plaintiff had, in every instance, acted as promptly as possible. Even if, under such circumstances, a defendant who had had no knowledge of the pend-

¹ 12. The process of manufacturing a nonplaniform article which consists in superposing a plurality of layers of fibrous material associated with a phenolic condensation product and molding the superposed layers by means of a form of the proper shape while applying pressure and heat to compact and harden the materials.

ing application could escape an injunction on final hearing (and, as to this, we intimate no opinion), this defendant can claim no such standing. The inventor himself had been active from the beginning in the infringement, either as one of the partnership associates at the outset, or as an active and important officer of the later organized corporate defendant. The defendant and its predecessors were clearly chargeable with his knowledge. He knew that when the infringement began, this application had been filed and assigned to plaintiff, with claims broad enough to reach defendant's article, and he never had reason to suppose that the application had been finally rejected. [fol. 273] We cannot see that defendant has any right to say it was misled either by action or by silence. To predicate fatal laches upon silence before the patent issued would be to stand on an unsafe basis. The situation is not, we think, fairly analogous to that in *Lane Co. v. Locke*, 150 U. S. 193, 200.

As to the breadth of the claims: Other claims of the patent refer to what is called the two-step process and require that the sheets or layers should be first heated and pressed to secure unity of composition, then subjected to a further and different heat or pressure, or both, to make permanent the desired shape of the article. The utter omission of any reference to or implication of the two-step process in claims 11 and 12, and their entire dependence upon the single step recited, is convincing evidence that there was no intent to have these claims limited to the two-step process; and this conclusion is compelled, even though it is true that their difference in this respect from the other claims is not the sole manner in which they are distinguished therefrom. In many cases, perhaps usually, claim differentiation is not sufficient to compel the broader construction of one of the claims if there are differences in other respects; but in this case, the omission of the two-step limitation is so plainly intentional that we cannot neutralize it by a counter-inference which is at best uncertain. These two claims are within the rule that an unambiguous claim cannot prevail over an apparent anticipation by reading a limitation into it. If these claims are not thus limited, infringement is conceded; and the issue of validity must therefore be decided; but plaintiff would escape that issue by reliance on O'Connor's estoppel. We think he was not estopped. This question justifies an inquiry into the basis of the estoppel enforced against the patentee assignor. The rule itself has become one of general acceptance, but our attention has not been directed to any satisfactory consideration of its basis or theory; and perhaps for this reason there has been much confusion in its application.

Estoppels forbid one to speak the truth, and hence technical estoppels are not favored. Omitting those by record, they are two kinds, by deed and in pais. On a somewhat exhaustive search we find no considered opinion holding that the estoppel of a patent grantor arises by deed;² nor is there clear reason for such conclusion. An [fol. 274] assignment of patent need not be in writing at all, as be-

² Assumptions, without discussion, that the estoppel is of this character have been made, e. g. *Chicago Co. v. Pressed Steel Co.*—C. C. A.—7—243 Fed. 863, 887; *Walker*, Sec. 469.

tween the parties; but, if it is, the common form contains no covenants of warranty. It sells and assigns "all my right, title and interest in and to the said invention and patent." There is close analogy to a quit-claim; at the most, it may be, the implication is of good title to the grant and not that the grant is good; with real estate, a conveyance from the sovereign gives good title to the land, and so title to the grant and title to the land are inseparable; not so as to patents, for the grant of the monopoly is always defeasible by third parties, and the title to the grant may be immaterial;—but even if the transfer of an existing grant of monopoly may create an estoppel by deed forbidding the grantor to deny the validity of the grant, this theory is inapplicable to the transfer of the inchoate right suggested by a pending application. By the common form of transfer the grantor in effect says: "Here is my device; I do not know whether it is patentable, or if it is, how broadly; take it, prosecute the patent application and get what you can." The formulation of the grant may be, and was here, delayed for years after the inventor's connection with the matter ceased, and the patent may be issued with broad claims which the inventor never made and which he knew were not his invention. Manifestly, as we think, the theory of estoppel by deed is untenable.³

This leads to the conclusion that this particular estoppel arises merely from those principles of good faith, the application of which create equitable estoppels. If the inventor sold his invention, receiving a consideration, and either expressly or by implication caused or permitted the vendee to believe that it would get a good title to a monopoly of at least a specified extent or even of an extent to be later determined by the patent office, for him later to deny the existence of the thing he sold and was paid for, would be to have misled the vendee prejudicially; and hence he may not deny. This is the basis upon which this rule has been frequently put either expressly or by assumption.⁴

[fol. 275] Considered from this basis, O'Connor is not estopped as to the two claims in suit. It is not controlling that the only consideration he received was his salary as an employe, for, if it was part of the contract of employment that he should assign his inventions, the salary was ample consideration for applying as complete an estoppel as the other facts justified; and, even though the employer paid nothing more than it would have paid anyway, and was not in this particular misled to its prejudice, yet it undertook and expended the effort and money necessary to get the patent and it may be presumed to have conducted its business thereafter on the faith of whatever representations were made to it. Hence the element of prejudice sufficiently appears.

³ In *Siemens Co. v. Duncan Co.*, supra, it was found that Duncan had represented that he was entitled to, and had sold and conveyed the right to, the precise monopoly covered by the claim sued upon; from this basis, an estoppel followed of necessity; the name of it was not important.

⁴ *Babcock v. Clarkson*—C. C. A. 1—63 Fed. 607; *Onderdonk v. Fanning*, 4 Fed. 148, 150; *Consolidated Co. v. Guilder*, 9 Fed. 156, 158; *Time Co. v. Hammer*, 19 Fed. 322, 323; *Woodward v. Boston Co.*, 60 Fed. 283, 284; *Natl. Co. v. Connecticut Co.*, 73 Fed. 491, 493.

Also it may be granted that these two claims were properly readable upon the specification and drawings of the application signed by O'Connor,—that is to say, in the language of the patent office, that he had the right to make these claims. Nevertheless they expressed a conception of the invention which rested solely on the “non-planiform” shape of the article and was in this respect broader than any claim which O'Connor had drafted, and if the prior Baekeland patent had been known to O'Connor as it became known to his assignees when it later compelled them to abandon the original broad claims, he probably never would have claimed as his the invention thus formulated. The record does not support the inference that O'Connor either expressly or impliedly represented to the Westinghouse Company that he was the inventor of the process defined in these two claims; and hence the claim of estoppel must fail.

Coming directly to the question of validity, and giving these claims the broad construction reaching the one-step process, and necessary in order to make out an infringement, it is entirely clear that there is no creative virtue in the mere “non-planiform” thought, and hence that they are not patentable over Baekeland. Indeed, no argument to the contrary is made by counsel.

The decree below dismissing the bill is affirmed.

[fol. 276] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE
SIXTH CIRCUIT

NOTICE OF MOTION TO STAY MANDATE—Filed April 30, 1923

Messrs. Wood & Wood, 1505 First National Bank Bldg., Cincinnati, O.:

You will please take notice that on Tuesday, the 8th day of May, 1923, or as soon thereafter as counsel can be heard, we shall present for hearing the motion for stay of mandate hereto attached.

Allen & Allen, Attys. for Appellant.

Service of the foregoing notice and motion duly acknowledge this 30th day of April, 1923.

Wood & Wood, Attys. for Appellee.

UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT

MOTION TO STAY MANDATE

Now comes the Westinghouse Electric & Manufacturing Company, the appellant in the above entitled cause, by its counsel and moves the Court for a stay of mandate in said cause for sixty days pending an application to the Supreme Court of the United States for a writ of certiorari.

Allen & Allen, Attys. for the Westinghouse Electric & Mfg. Co.

[fol. 277] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE
SIXTH CIRCUIT

ORDER STAYING MANDATE—Filed May 15, 1923

Ordered, that motion to stay mandate herein pending application to the Supreme Court for writ of certiorari, is hereby granted subject to the following condition: that appellants shall within 30 days from the date of this order file its petition for the writ in the Supreme Court and, upon giving notice to opposing counsel of date for submission as required by Supreme Court Rule 37, present the petition in open court on the first motion day thereafter and within five days after the first motion day following the expiration of said thirty day period, file in this court proof of such filing, notice and presentation of petition. Unless this condition is complied with, or its non-observance sanctioned by the Supreme Court, the mandate herein will issue either upon the court's own motion and without notice, or on motion of opposing party upon notice, as to the court may seem best; but in the event of compliance with the condition imposed or of such sanctioned non-observance the mandate will be stayed until final action in the case is taken by the Supreme Court.

[fol. 278] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE
SIXTH CIRCUIT

CLERK'S CERTIFICATE

I, Arthur B. Mussman, Clerk of the United States Circuit Court of Appeals for the Sixth Circuit, do hereby certify that the foregoing is a true and correct copy of the record and proceedings in the case of Westinghouse Electric & Mfg. Co. vs. Formica Insulation Company, No. 3717, as the same remains upon the files and records of said United State Circuit Court of Appeal for Sixth Circuit, and of the whole thereof.

In testimony whereof, I have hereunto subscribed my name, and affixed the seal of said Court, at the City of Cincinnati, Ohio, this 4th day of June, A. D. 1923.

Arthur B. Mussman, Clerk of the United States Circuit Court of Appeals for the Sixth Circuit. (Seal United States Circuit Court of Appeals, Sixth Circuit.)

[fol. 279] WRIT OF CERTIORARI AND RETURN—Filed Nov. 21, 1923

UNITED STATES OF AMERICA, ss:

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the Honorable the Judges of the United States Circuit Court of Appeals for the Sixth Circuit, Greeting:

Being informed that there is now pending before you a suit in which Westinghouse Electric & Manufacturing Company is appellant, and The Formica Insulation Company is appellee, which suit was removed into the said Circuit Court of Appeals by virtue of an appeal from the District Court of the United States for the Southern District of Ohio, and we being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said Circuit Court of Appeals and removed into [fol. 280] the Supreme Court of the United States, do hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable William H. Taft, Chief Justice of the United States, the eleventh day of October, in the year of our Lord one thousand nine hundred and twenty three.

Wm. R. Stansbury, Clerk of the Supreme Court of the United States.

UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT, ss.

I, Arthur B. Mussman, clerk of the United States Circuit Court of Appeals for the Sixth Circuit, do hereby certify that the transcript of the record of the proceedings of this court in the within entitled case heretofore certified by me for filing in the Supreme Court of the United States was correct and complete as the same then appeared in this court.

In pursuance of the command of the foregoing writ of certiorari I now hereby certify that on the nineteenth day of November, A. D., 1923 there was filed in my office a stipulation in the above entitled case in the following words, to-wit:

[Title omitted]

The Supreme Court of the United States having on the 11th day of October, 1923, issued a Writ of Certiorari herein, it is hereby Stipulated by and between counsel for the above named parties that the transcript of record already on file with the Clerk of the Supreme Court of the United States on the petition for certiorari shall upon

the filing of the physical exhibits therein referred to, be taken as a return to the said writ of certiorari, also that said exhibits may be retained by counsel for plaintiff and filed at any time prior to the hearing.

Dated, October 15, 1923.

John C. Kerr, Counsel for Plaintiff-Appellant. John H. Lee,
Counsel for Defendant-Appellee.

I further certify that the above is a true and correct copy of said stipulation and of the whole thereof. Witness my official signature and the seal of said Circuit Court of Appeals at the City of Cincinnati, Ohio, in said Circuit this nineteenth day of November, A. D. 1923.

Arthur B. Musseman Clerk United States Circuit Court of Appeals for the Sixth Circuit. (Seal United States Circuit Court of Appeals, Sixth Circuit.

[fols. 281 & 282] [File endorsement omitted.]

